

336-350 Rindge Avenue Planning Board Submission - Appendix

Cambridge, MA

08/24/ 2026



boston
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PCA Architecture, Interiors + Planning

Appendix

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02 Green Building Report_____01

Article 22 Green Building Report

350 Rindge Avenue

Cambridge, MA



Prepared by: **enviENERGY Studio**
Date: **August 18, 2026**

Green Building Project Checklist

Green Building

Project Location: 350 Rindge Avenue

Applicant

Name: 350 Rindge LLC, c/o Affordable Housing Services Collaborative, Inc., & Boston Communities LLC

Address: 336-350 Rindge Avenue, Cambridge MA

Contact Information

Email Address: Matt@bostoncommunities.com (Matthew Robayna)

Telephone #: 305-606-1576

Project Information (select all that apply):

- ☒ New Construction – GFA: 129,154 sf
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: _____
 - ☐ Existing Use(s) of Rehabilitated Area: _____
 - ☐ Proposed Use(s) of Rehabilitated Area: _____
- ☐ Requires Planning Board Special Permit approval
- ☐ Subject to Section 19.50 Building and Site Plan Requirements
- ☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

- ☐ Leadership in Energy and Environmental Design (LEED) – Version: _____
 - ☐ Building Design + Construction (BD+C) – Subcategory: _____
 - ☐ Residential BD+C – Subcategory: _____
 - ☐ Interior Design + Construction (ID+C) – Subcategory: _____
 - ☐ Other: _____
- ☒ Passive House – Version: PHIUS CORE 2024
 - ☒ PHIUS+
 - ☐ Passivhaus Institut (PHI)
 - ☐ Other: _____
- ☐ Enterprise Green Communities – Version: _____



Project Phase

☐ SPECIAL PERMIT/

DEVELOPMENT REVIEW

Review Section 22.25.1 of the Cambridge Zoning Ordinance. Attach the supporting materials listed.

Required Submissions

All rating programs:

- ☐ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit/Development Review)

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Rating System Narrative

The 350 Rindge Avenue project consists of a new ten-story residential development containing 91 dwelling units in Cambridge, Massachusetts. The design team has prioritized high-performance building strategies throughout the project in order to support long-term sustainability goals. Key objectives include reducing energy and water consumption, improving the durability and operational efficiency of building systems, and minimizing environmental impacts on the surrounding community and municipal infrastructure.

The project is subject to the City of Cambridge Article 22 requirements as well as the Opt-In Specialized Energy Code Passive House provisions. Consistent with the requirements of Section 22.20 of the Cambridge Zoning Ordinance, the project demonstrates compliance with the following provisions:

- **22.23 Green Building Rating Programs:** Section 22.23.1 authorizes three compliance pathways: LEED, Passive House, and Enterprise Green Communities. The 350 Rindge Ave development will be Passive House Certifiable under the PHIUS CORE 2024 standard through the Passive House Institute US (PHIUS), satisfying this requirement. Additional information is provided in the Passive House section of this report.
- **22.24.2 Green Commissioning:** A commissioning team has been retained to provide enhanced commissioning services comparable to LEED v4 Enhanced Commissioning and aligned with the City of Cambridge Green Commissioning requirements. The commissioning scope will confirm that building systems and assemblies are properly designed, installed, tested, and operating as intended to meet the project's sustainability and performance objectives.
- **22.24.5 Flood Resilience:** The project will be designed to comply with applicable flood resilience requirements.

Complying with PHIUS CORE 2024 certification reflects the project team's commitment to significantly reducing building energy demand while maintaining a high level of indoor environmental quality for residents. This approach supports both the City of Cambridge's climate action objectives and the Commonwealth of Massachusetts' decarbonization targets. The project will comply with the Massachusetts Stretch and Specialized Energy Codes through the all-electric and Certified Performance pathways.

The design focuses on lowering heating and cooling loads and improving overall building efficiency, which in turn helps reduce peak demand on the local electrical grid. Key design strategies include a highly insulated enclosure with minimized thermal bridging, a continuous air barrier, and high-performance windows. Balanced mechanical ventilation with energy recovery will provide filtered outdoor air to all residential units. Heating and cooling will be delivered using cold-climate air-source heat pumps, and the domestic hot water system will be fully electric.

The enviENERGY Studio team, which includes three Certified Passive House Consultants (CPHCs), is providing Passive House and sustainability consulting services for the project. The team will guide the design through PHIUS compliance while also ensuring compliance with all applicable local and

state energy regulations. As the project advances, the design team will continue to coordinate closely through regular sustainability and performance workshops to ensure that the project's environmental goals are fully integrated into both design and construction

Passive House Feasibility Report

1. EXECUTIVE SUMMARY

enviENERGY Studio is providing Passive House Institute US (Phius) consulting services for the proposed 350 Rindge Avenue development in Cambridge, Massachusetts. The purpose of this feasibility study is to evaluate the project's compliance with the 2023/2025 Massachusetts Stretch Energy Code and Specialized Opt-In Energy Code through the C401.2.2 Certified Performance Standard compliance pathway. The proposed development is a ten-story mixed-use building with a total gross floor area of approximately 129,000 square feet, including 4,800 square feet of ground-floor retail space and 5,200 square feet of parking. The multifamily residential portion consists of approximately 119,000 square feet and contains 91 dwelling units.

This project will meet all the requirements of Phius CORE 2024, which require the design to comply with annual and peak heating and cooling load requirements, as well as limits on source energy use and air infiltration. The building performance simulations were developed utilizing the provided Conceptual Design drawings, mechanical equipment narratives, and the Phius 2024 Passive Building Standard Certified Guidebook v25.1.0.

The study and analysis presented in this report focuses on the building envelope and mechanical equipment performance to enhance thermal comfort, mitigate moisture and condensation risks, reduce annual and peak heating and cooling loads, and lower the proposed building's energy consumption. The combined performance calculations are shown in the following section of this report.

The following images are results directly from the WUFI Passive software. Note that the latest version of the software has not been updated and still calculates Phius CORE 2021 source energy targets. While the software indicates a source energy target of 4,450 kWh/Person.yr, the target for this project is 5,075 kWh/Person.yr to meet Phius CORE 2024 compliance. Due to limitations in WUFI Passive modeling, the non-residential space must be modeled separately. The combined performance calculations are shown in the following section of this report.

Figure 1.1: Results from WUFI Passive (Residential)

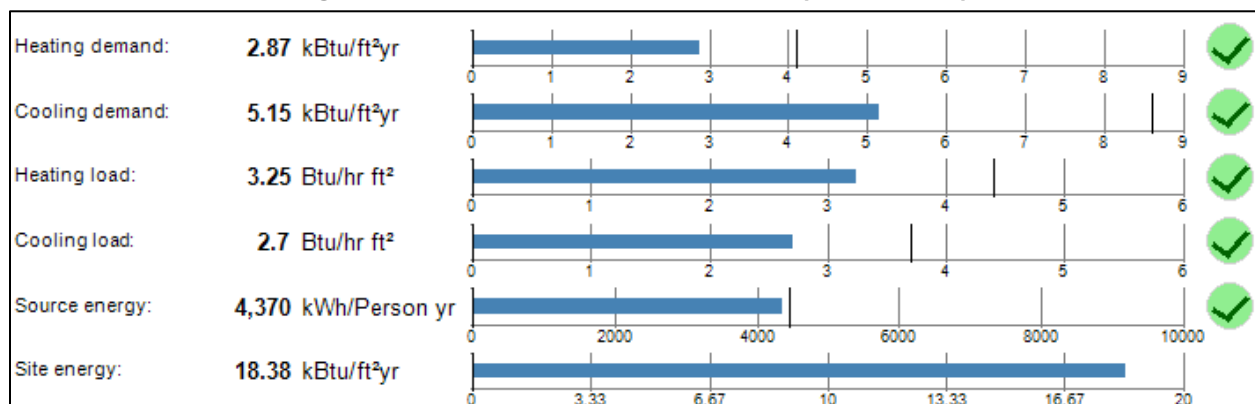
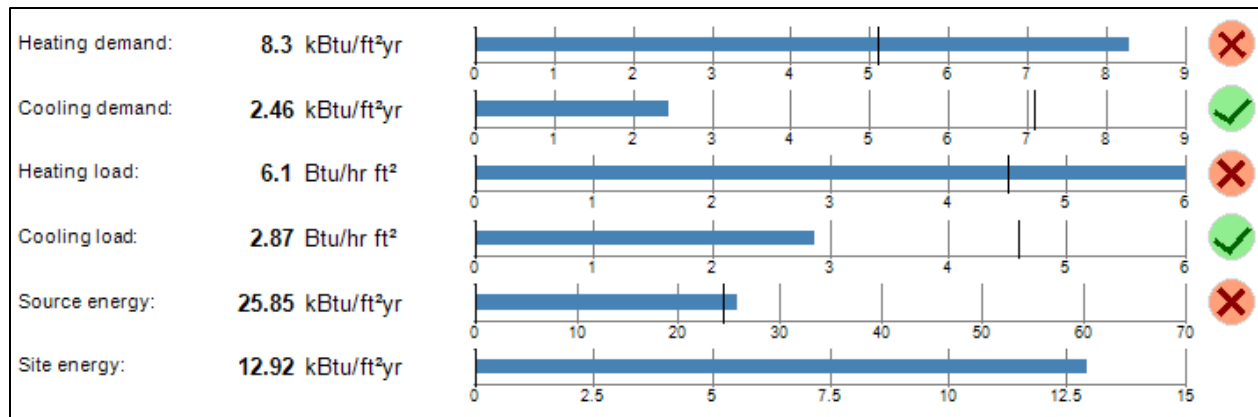


Figure 1.2: Results from WUFI Passive (Commercial)



Mixed-Use Project Calculations for Whole Building Compliance

The following calculations demonstrate the combined performance of the residential program and the future retail space following the Phius Whole Building Certification pathway. Commercial fit-outs are not included in this scope and will therefore follow the Phius “Unfinished Spaces (UF)” protocol until more information becomes available. The “Limit” and iCFA of the residential and non-residential portions of the building are from the Performance Criteria Calculator featured above. Note that the internal conditioned floor area (iCFA) used for the Phius Performance Criteria calculations is preliminary and subject to change as the design progresses. The “Use” values are from the WUFI Passive model results and are summarized in the following table.

Table 1.1: Phius CORE 2024 Results Summary

350 Rindge Avenue					
Phius CORE 2024 Criteria	Limit	Combined	Residential	Commercial	Margin (%)
Heating Demand (kBtu/ft2yr)	4.09	3.09	2.87	8.30	24.45%
Cooling Demand (kBtu/ft2yr)	8.62	5.04	5.15	2.46	41.53%
Peak Heating Load (Btu/ft2hr)	4.40	3.37	3.25	6.10	23.41%
Peak Cooling Load (Btu/ft2hr)	3.72	2.71	2.70	2.87	27.15%
Source Energy Residential: (kWh/person.yr)	5,075	4,370	4,370	N/A	13.89%
Source Energy Commercial: (kBtu/ft2yr)	30.0	25.85	N/A	25.85	13.83%
Site Energy (kBtu/ft2yr)	N/A	18.16	18.38	12.92	N/A

*iCFA = interior conditioned floor area, measured from the interior dimension of exterior walls.

Note: WUFI Passive is an envelope compliance tool, not an energy estimation tool. This report's predicted energy use intensity (pEUI) does not necessarily reflect the building's actual energy performance. Phius uses default values for interior lighting and miscellaneous equipment, and does not align with the ASHRAE energy modeling procedures.

2. ENERGY MODELING ASSUMPTIONS AND APPROACH

Using the guidelines outlined in the Phius 2024 Passive Building Standard Certified Guidebook v25.1.0, the model was defined using the provided conceptual design drawings and mechanical narratives. Design scenarios were modeled in accordance with the Phius energy modeling protocol in Section 1.4.4 of the Guidebook, covering the building envelope, HVAC systems, domestic hot water (DHW) system, lighting, miscellaneous loads, and occupancy and equipment schedules. The proposed design scenarios provide a pathway to Phius CORE 2024 certification through energy conservation and peak load mitigation measures.

At this stage, a 10% buffer is recommended across all compliance criteria to hedge against future design modifications and the impact of thermal bridging, which is not yet accounted for in this study.

2.1 Building Envelope

The modeled building performance assumes a thermally robust and airtight envelope designed to support high levels of energy efficiency and occupant comfort. The exterior wall assemblies consist of steel-framed insulated construction throughout the building. The glazing system includes a combination of operable and fixed windows serving the residential units, as well as storefront glazing and glazed entrance doors at the ground floor and amenity spaces. The tables below summarize the thermal performance characteristics of the proposed building envelope and its alignment with Phius performance targets. The estimated window-to-wall ratio and proposed U- and R-values are based on the current conceptual design and massing plans. As the design advances, the project team will continue to evaluate envelope assemblies, glazing systems, and construction details to further optimize thermal performance, airtightness, and overall energy efficiency.

Table 2-1: Exterior Opaque Assembly Performance

Exterior Envelope Component	Thermal Properties
Roof	R-40 C.I. above deck
Exterior Walls	R-19 Cavity + R-12 C.I. (3")
Exterior Floor	Steel Joist Floor with R-30 Batt Insulation + R-4 C.I. (1")
Slab on Grade (R_{eff} -value)	2" R-10 C.I. below
Footing Insulation (Exterior-Side)	2" R-10 C.I. (Down to footing)

* R_{eff} -value refers to the effective thermal resistance when considering framing and other assembly components.

Table 2-2: Exterior Transparent Assembly Performance

Exterior Envelope Component	Thermal Properties
Fixed Windows (U_w -value* / SHGC)	U-0.17 / SHGC-0.41
Operable Windows (U_w -value* / SHGC)	U-0.19 / SHGC-0.41
Storefront (U_w -value / SHGC)	U-0.17 / SHGC-0.36
Entryways (U_w -value / SHGC)	U-0.63 / SHGC-0.33
WWR (%)	Approx 27%

* U_w -value refers to the effective thermal resistance when considering framing and other assembly components.

2.2 Building Airtightness

The Phius requirement for the maximum allowable air leakage rate of the building envelope is 0.06 CFM/ft² @ 50 Pascals (Pa). This is significantly lower than the Massachusetts Stretch Energy Code maximum rate of 0.23 CFM/ft² @ 50 Pa of pressure. Note that a 10%+ buffer has been captured in the WUFI Passive model for this feasibility study.

The detailed drawings will include a clear definition of the building's continuous air barrier, as well as individual details of all building component connections, penetrations, and window installations. To meet these stringent requirements, the design and construction team will ensure that all joints, penetrations, and openings are adequately taped or sealed. The Phius Verifier will conduct blower-door testing at the end of construction to confirm the project's compliance with air-leakage requirements.

2.3 Thermal Bridging

Thermal bridging was not accounted for in this feasibility study, as it is not required at this stage of modeling. However, the impact of thermal bridging will be included in the WUFI Passive model used for Design Certification through 2-D THERM analysis.

2.4 Occupancy

According to Section 1.3.4.2 of the Phius 2024 Guidebook v25.1.0, residential building loads and ventilation rates are established under the assumption that these systems will operate continuously. The peak occupancy density is calculated as the number of bedrooms plus 1 for residential spaces, with studio apartments counted as 0-bedroom units.

Table 2-3: Phius 2024 Occupancy Inputs - Residential

Category	Amount
Design Occupancy	267
Number of Units	91
Number of Bedrooms*	176

* Studio units are counted as zero-bedroom units

The commercial peak occupancy is calculated as 70% of 60 gross square feet (GSF)/person, per the IBC 2021 entry for retail. Average occupancy is calculated as 30% of the design (max) occupancy. While this will most likely not be the case, the ventilation system is set to operate 24/7 in WUFI Passive per UF Protocol. This assumption is appropriate at this stage because it is the most conservative and may be modified when more information becomes available.

Table 2-4: Phius 2024 Occupancy Inputs - Commercial

Category	Amount
Design (Max) Occupancy	56 (IBC 2021: 60 GSF/person)
Average Occupancy	17

2.5 Internal Loads

Phius requires that the lighting and plug loads used in the WUFI Passive model be calculated using the Phius Multifamily Lighting & MEL (Miscellaneous Electric Loads) Calculator. The calculated values for interior and exterior lighting and MELs were then input into the model. All lighting is assumed to be LED, and common areas are assumed to have occupancy sensors. All equipment, such as washer machines, dryers, and dishwashers, assume the national average for ENERGY STAR-rated appliances. These values must be updated as equipment is specified for the project.

Table 2-5: Lighting and Plug Loads

Load Source	Annual Usage – Residential	Annual Usage – Commercial
Interior Lighting	117,610 kWh/yr	16,500 kWh/yr
Exterior Lighting	2,592 kWh/yr	N/A
MEL (<i>Misc. Electric Loads</i>)	106,207 kWh/yr	N/A

2.6 Setpoints

The setpoints are modeled to match the required temperature setpoints for Phius certification. Below are the modeled temperature setpoints.

Heating set point: 68 °F

Cooling set point: 77 °F

2.7 Space Heating and Cooling

Heating and cooling systems serving the residential portions of the building were modeled in accordance with the MEP narrative, which identifies ducted fan coil units within each dwelling unit coupled with air-source heat pumps as the basis of design. The ground-floor commercial space is unfinished and do not have permanent equipment installed. To model the proposed equipment in WUFI Passive, the Phius Heat Pump Performance Estimator v25.1.1 calculated the following weighted averages for all equipment efficiencies and capacities:

Table 2-6: WUFI Passive Cooling Equipment Inputs

Equipment Parameter (Cooling)	WUFI Passive Input Residential	WUFI Passive Input Commercial
Modeled Cooling Capacity/System	589 kBtu/hr	N/A
Modeled Cooling COP	4.0	N/A
Number of Systems Needed	3	N/A

Table 2-7: WUFI Passive Heating Equipment Inputs

Equipment Parameter (Heating)	WUFI Passive Input Residential	WUFI Passive Input Commercial
Rated COP (17 °F)	2.38	N/A
Rated COP (47 °F)	2.55	N/A

2.8 Mechanical Ventilation

The proposed ventilation system consists of centralized rooftop energy recovery ventilation (ERV) units that provide balanced ventilation air and exhaust to the residential dwelling units. Based on the current MEP narrative, ventilation rates are assumed to be 50 CFM for units with one bathroom and 75 CFM for units with one-and-a-half or two bathrooms.

Common areas, including the lobby, corridors, and amenity spaces, are conditioned by concealed ducted fan coil units served by a multi-zone variable refrigerant flow (VRF) air-source heat pump system. Ventilation and HVAC system assumptions are based on the current MEP narrative and are intended to comply with the 2021 International Mechanical Code (IMC) and 2021 International Energy Conservation Code (IECC) as adopted by the Commonwealth of Massachusetts. Note that the ventilation rates have been increased by 10% as a buffer to account for future design or testing penalties.

Table 2-8: Mechanical Ventilation Systems

ERV Specifications	Central ERUs*
Sensible Heat Recovery (%)	75%
Latent Heat Recovery (%)	40%

*If no third-party verification data is available, a deration of 12% must be applied to energy recovery efficiency.

Table 2-9: Ventilation Airflow

Unit Sizes	Model Input
1 Bedroom	50 CFM
2 Bed + 2 Bath	75 CFM
3 Bed + 2 Bath	75 CFM

For the unfinished retail space, it is assumed that no ventilation device will be installed by the base-building team. However, due to software limitations, WUFI Passive cannot treat spaces as unventilated. Thus, a default value of 0.3 ACH is entered for this area.

It is important to note that the total measured supply and exhaust airflow must differ by no more than 10%. Additionally, the proposed ERV equipment must meet the following requirements for indoor air quality:

- Install MERV 8 filter on the supply intake ductwork (recommend MERV 13 or higher).
- Install MERV 8 filter on the exhaust ductwork.

2.9 Domestic Hot Water

The domestic hot water (DHW) system is assumed to consist of individual hybrid electric heat pump water heaters serving each dwelling unit. The proposed units have a storage capacity of 50 gallons and a Uniform Energy Factor (UEF) of 3.80.

Table 2-10: DHW Systems

Design Scenario	Model Input
Hybrid Electric HP Water Heater	Unitary Storage Tanks (UEF 3.80)

In addition to the proposed DHW design, the following criteria must be met:

- Minimum of R-3 insulation on all DHW distribution pipes (R-8 recommended).
- Pass the EPA WaterSense Hot Water Delivery requirement; a maximum of 1.8 gallons of water stored in the longest run of DHW piping to the fixture for multifamily projects with individual water heaters.

2.10 DOE Zero Energy Ready Homes (ZERH)

Solar-Ready

Because this project will be all-electric with no fossil fuel usage, compliance with the Specialized Opt-in Code requirement to install on-site solar PV is not required. However, for Phius CORE 2024 certification, a project must comply with the DOE Zero Energy Ready Home Multifamily PV-Ready Checklist. This includes reserving 40% of the roof area for future solar photovoltaic (PV) installation, providing the necessary blocking for the future solar array, and marking its location in a design drawing.

Electric Vehicle-Ready

This project must also comply with the U.S. DOE Zero Energy Ready Home Multifamily EV-Ready Checklist. This requires 10% of the parking allocated to the residential building to be EV-ready, and 10% of the parking to be allocated for the full installation of Electric Vehicle Supply Equipment (EVSE).

2.12 ENERGY STAR Multifamily New Construction (MFNC)

This building must meet the co-requisite requirements for ENERGY STAR Multifamily New Construction (MFNC). This entails two potential pathways for compliance:

ASHRAE Path

If the project chooses to pursue the ASHRAE Path to compliance, the source energy requirement must be lowered by 15% from the threshold established by the Phius Performance Criteria Calculator without renewable energy. This pathway won't be pursued.

ERI Path

Project will pursue the ERI Path. This requires each individual unit's HERS rating to be equivalent to the minimum requirements of the ENERGY STAR Multifamily Reference Design, as assessed by an EPA-recognized Home Certification Organization (HCO).

Net Zero Narrative

Project Name/ Address: 350 Rindge Ave, Cambridge, MA

Net Zero Narrative

Project Profile

Development Characteristics

Lot Area (sq.ft.):	22,364 sf
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Existing building to be replaced
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	Residential and Commercial; 128,867 SF
Proposed Building Height(s) (ft. and stories):	10 stories, 120'
Proposed Dwelling Units:	91
Proposed Open Space (sq.ft.):	3,509 sf (15.7%)
Proposed Parking Spaces:	19
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	100 long-term and 12 short-term

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)			
Rating System & Version:	N/A	Seeking Certification?*	Yes No TBD
Rating Level:		# of Points:	

Enterprise Green Communities			
Rating System & Version:	N/A	Seeking Certification?*	Yes No TBD
Rating Level:		# of Points:	

Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)			
Rating System & Version:	PHIUS CORE 2024	Seeking Certification?*	Yes No TBD

*NOTE: Certification is not required through the Green Building Requirements. However, you may choose to indicate if the Project Team intends to pursue formal certification through these Green Building Rating Programs (or their affiliates).

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	<i>R-40 c.i. above deck</i>
Foundation:	<i>R-10 c.i. down to footing; R-10 c.i. under slab</i>
Exterior Walls:	<i>R-19 cavity + R-12 c.i.</i>
Windows:	<i>Punch: U-0.19 & 0.17 /SHGC-0.41 Storefront: U-0.17/ SHGC-0.36</i>
Window-to-Wall Ratio:	<i>27%</i>
Other Components:	<i>Entryways: U-0.63/ SHGC-0.33</i>

Envelope Performance:

[Project Team Comment: Project is pursuing Passive House certification pathway for energy code compliance. There is no baseline to compare to. Additionally, Passive House envelope design is significantly better than IECC 2021 prescriptive requirements.]

Provide estimates of the thermal transmittance (U-value) for the building envelope compared to "Baseline" standards required by the Massachusetts Stretch Energy Code, latest adopted edition.

	Proposed		Baseline	
	<i>Area (sf)</i>	<i>U-value</i>	<i>Area (sf)</i>	<i>U-Value</i>
Window				
Wall				
Roof				

Envelope Commissioning Process:

Project will be Passive House certifiable. Envelope review and verification are requirements of Passive House certification.

Building Mechanical Systems

Systems Descriptions:

Space Heating:	<i>fan coil units within each dwelling unit coupled with air-source heat pumps</i>
Space Cooling:	<i>fan coil units within each dwelling unit coupled with air-source heat pumps</i>
Heat Rejection:	<i>N/A</i>
Pumps & Auxiliary:	<i>N/A</i>
Ventilation:	<i>Central Energy Recovery system</i>
Domestic Hot Water:	<i>Individual hybrid electric heat pump heaters per residential units</i>
Interior Lighting:	<i>All LED and meets IECC 2021 requirements</i>
Exterior Lighting:	<i>LED and meets IECC 2021 requirements</i>
Other Equipment:	<i>All appliances will be Energy Star certified</i>

Systems Commissioning Process:

The project team has engaged a Commissioning Team who will perform commissioning services to coly with Article 22, and consistent with Passive House verification procedures. The team will verify and document that all building systems and assemblies are planned, designed, installed, tested, and operated to meet the Green Commissioning requirements.

Building Energy Performance Measures

Overview

Broadly describe the ways in which building energy performance has been integrated into the following aspects of the project's planning, design, engineering, and commissioning. More detail on specific measures can be provided in appendices.

Land Uses:	<i>The site has been previously developed . The selected site will provide access to public transportation, bicycle network and facilities.</i>
Building Orientation and Massing:	<i>The building orientation is largely dictated by the site and surrounding buildings; however, it has been optimized to the extent possible to reduce heating and cooling loads.</i>
Envelope Systems:	<i>The building envelope is designed to Passive House standards and incorporates continuous insulation and a highly airtight system.</i>
Mechanical Systems:	<i>All-electric building incorporating high-efficiency heat pump for heating and cooling and Energy Recovery Units (ERU) for ventilation.</i>
Renewable Energy Systems:	<i>TBD</i>
District-Wide Energy Systems:	<i>N/A</i>
Other Systems:	<i>N/A</i>

Integrative Design Process

Describe how different parties in the development process (owners, developers, architects, engineers, contractors, commissioning agents) have collaborated in the design.

Include the Basis of Design and

Owner's Project Requirements and describe how they have been informed by planning activities such as meetings or design charrettes. Describe how continuing collaborative processes will inform Schematic/Design and Construction Documents.

The project team includes several Certified Passive House Consultants (CPHC), who will lead the sustainability efforts and initiatives throughout the design and construction process. Sustainable design and energy efficiency goals were established early and will be evaluated in each phase as the project develops. Strategies associated with the building envelope attributes, lighting design, thermal comfort ranges, plug and process loads, and operational parameters and their impact on the building energy performance were explored and discussed in an early-design WUFI model. An early design WUFI Passive model was developed and used as an interactive and dynamic platform to evaluate systems synergies and the various pathways for achieving the targeted heating and cooling load and demand and required performance improvements in the most cost-effective manner.

Green Building Incentive Program Assistance

Describe any programs applicable to this project that would support improved energy performance or reduced greenhouse gas emissions, and which of those programs have been contacted and may be pursued. Programs may be offered by utility companies, government agencies, and other organizations, and might include rebates, grants, financing, technical assistance, and other incentives.

Project is registered with Mass Save Passive House Incentives program.

Net Zero Scenario Transition

Describe the technical framework by which the project can be transitioned to net zero greenhouse gas emissions prior to 2050, acknowledging that such a transition might not be economically feasible at first. This description should explain the future condition and the process of transitioning from the proposed design to the future condition.

	Net Zero Condition:	Transition Process:
Building Envelope:	<i>The building envelop will be designed and constructed to Passive House standards. High-performance and air-tight envelope.</i>	<i>The project envelope design is already in compliance with Net Zero Carbon goals.</i>
HVAC Systems:	<i>The building HVAC system will be all-electric, utilizing high-efficiency Heat Pump systems.</i>	<i>The current design is Zero Carbon Ready.</i>
Domestic Hot Water:	<i>The domestic hot water system will be heat pump heaters. Low-flow plumbing fixtures will be used.</i>	<i>The current design is Zero Carbon Ready.</i>
Lighting:	<i>All LED light fixtures will be used throughout the building.</i>	<i>The current design is Zero Carbon Ready.</i>
Renewable Energy Systems:	<i>There will be on-site solar PV array. To be sized.</i>	.
Other Strategies:	<i>N/A</i>	<i>N/A</i>

Energy Systems Comparison

Overview

This section should describe the results of an analysis comparing the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building using energy systems that do not consume carbon-based fuels on-site compared to code-compliant energy systems that consume carbon-based fuels on-site.

The project is all-electric and extremely efficient.

Assumptions

Describe what building energy systems were included and excluded in your analysis and why.

	Included in analysis?		Describe the systems for which this was analyzed or explain why it was not included in the analysis:
	Yes	No	
Solar Photovoltaics:	x		The layout is preliminary and system hasn't been sized yet.
Solar Hot Water:		X	
Ground-Source Heat Pumps (Geothermal):		X	Due to challenges with site-related logistics and feasibility, geothermal analysis will not be pursued.



Net Zero Narrative

Project Name/ Address: 350 Rindge Ave, Cambridge, MA

Water-Source Heat Pumps:		X	Not ideal for Passive House project and this size building.
Air-Source Heat Pumps:	X		Basis of design
Non-Carbon-Fuel District Energy:		X	
Other Non-Carbon-Fuel Systems:		X	

Non-Carbon-Fuel Scenario

Project is all-electric and doesn't use any fossil fuel.

Solar-Ready Roof Assessment

The purpose of this assessment is to determine the technical feasibility of solar energy system installation, either as part of the proposed project or in the future. It is helpful to supplement this narrative with a plan depicting the information provided.

Total Roof Area (sq. ft.):	<i>13,541 sf</i>
Unshaded Roof Area (sq. ft.):	<i>13,541 sf</i>
Structural Support:	<i>Structure is sufficient for support</i>
Electrical Infrastructure:	<i>Inverter and other required infrastructure will be provided.</i>
Other Roof Appurtenances:	<i>A significant portion of the roof will be occupied by condensers</i>
Solar-Ready Roof Area (sq. ft.):	<i>Solar PV will be installed. System size is TBD</i>
Capacity of Solar Array:	<i>TBD</i>
Financial Incentives:	<i>TBD</i>
Cost Feasibility:	<i>TBD</i>

Net Zero Narrative

Project Name/ Address: 350 Rindge Ave, Cambridge, MA

Results

Briefly summarize the results of the analysis and how it has informed the design of the project. Also include figures for the “Non-Carbon-Fuel Scenario” in the concluding Summary Table at the end of the Net Zero Narrative. Attachments can be provided with more specific figures and metrics regarding installation, maintenance, and upkeep costs (exclusive of operating fuel expenses), but a full report is not necessary.

	Proposed Design		Non-Carbon-Fuel Scenario	
	Installation Cost	Maintenance Cost	Installation Cost	Maintenance Cost
Space Heating				
Space Cooling				
Heat Rejection				
Pumps & Aux.				
Ventilation				
Domestic Hot Water				
(Financial Incentives)				
Total Building Energy System Cost				

Project is all-electric and doesn't use any fossil fuel.



Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

Describe the assumptions and methodology used to conduct preliminary energy modeling and set energy targets for the project. Specifically describe what components of the building were included and excluded.

This project will meet all the requirements of Phius CORE 2024, which requires the design to comply with annual and peak heating and cooling load requirements, as well as limits on source energy usage and air infiltration. The building performance simulations were developed utilizing the provided drawings, mechanical equipment narratives, and the Phius 2024 Passive Building Standard Certified Guidebook v25.1.0.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

[Project Team Comment: Project is pursuing Passive House certification pathway for energy code compliance. There is no baseline to compare to. The basis of design is all-electric, utilizing high-performance systems and it is net zero carbon ready and therefore, no additional scenarios were studied.]

The preliminary energy modeling results should be shown in a concluding table format similar to what is shown on the next page. It should compare the “baseline building” (Massachusetts Stretch Energy Code) to the proposed design, as well as the “net zero” scenario projected by 2050 and described later in this narrative.

	Baseline Building		Proposed Design		Future Net Zero Scenario		Non-Carbon-Fuel Scenario	
	kWh or Therms	% of Total	kWh or Therms	% of Total	kWh or Therms	% of Total	kWh or Therms	% of Total
Space Heating								
Space Cooling								
Heat Rejection								
Pumps & Aux.								
Ventilation								
Domestic Hot Water								
Interior Lighting								
Exterior Lighting								
Misc. Equipment								
	\$US, kBTU, kBTU/SF		\$US, kBTU, kBTU/SF		\$US, kBTU, kBTU/SF		\$US, kBTU, kBTU/SF	
Site EUI								
Source EUI								
Total Energy Use								
Total Energy Cost								
	kWh or Therms	% Total Energy	kWh or Therms	% Total Energy	kWh or Therms	% Total Energy	kWh or Therms	% Total Energy
On-Site Renewable Energy Generation								
Off-Site Renewable Energy Generation								
	Tons CO ₂ [/SF]		Tons CO ₂ [/SF]		% Reduction from Baseline			
GHG Emissions								
GHG Emissions per SF								

It may be helpful to present this information in a chart or graph. The following page provides examples.

CITY OF CAMBRIDGE EMBODIED CARBON REPORTING TEMPLATE

City of Cambridge Zoning Ordinance Amendment to Section 22.25.1(c) of Article 22, entitled Sustainable Design and Development (Ordinance No. 2022-20), Section 7. Embodied Emissions:

“A whole building lifecycle analysis of the estimated emissions generated by the construction of the Green Building Project. The Assistant City Manager for Community Development shall promulgate regulations for how these estimated emissions are to be reported.

Such regulations shall include at minimum the required reporting of estimated lifecycle emissions generated by the use of major building materials, including but not limited to wood, concrete, steel, aluminum and glass, using embodied emissions modeling software and industry standards acceptable to CDD staff. This paragraph will become effective on the date of final promulgation of the regulations for Green Building Projects that have not yet completed the initial stage of administrative review by such date, and shall not impose a requirement on any building project that does not meet the standard threshold for project review special permit of 50,000 square feet or includes housing

Applicability: For Projects after date of final promulgation of regulations (01/01/2024)

Is this project subject to Green Building Requirements (Section 22.20)?	X Yes ☐ No
Does this project meet the threshold for Project Review special permit (Section 19.23)?	X Yes ☐ No
Is the gross floor area of this project 50,000 square feet or more?	X Yes ☐ No
Does this project <u>exclude</u> dwelling units?	☐ Yes X No

Complete this reporting template if the answer is “Yes” to ALL of the above

Appendix

Affidavit

WUFI Passive Verification Report

Affidavit Form for Green Building Professional Special Permit/Development Review

Green Building

Project Location: 336-350 Rindge Avenue, Cambridge MA**Green Building Professional**Name: Laura Homich, AIA, CPHC, LEED BD+C☒ Architect☐ EngineerLicense Number: MA 20496Company: Prellwitz Chilinski Associates, Inc.Address: 221 Hampshire Street, Cambridge MA 02139

Contact Information

Email Address: Lhomich@pcadesign.comTelephone Number: 857-453-2904

I, Laura Homich, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

*Laura Homich*6/16/2026

(Signature)

(Date)

Attach either:

- ☒ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.
- ☐ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.





phius
certified
consultant

Laura Homich

has fulfilled the requirements for becoming a

Phius Certified Consultant: CPHC®

This certificate hereby attests that the above-named Consultant has completed training provided by Phius (Passive House Institute US) relating to construction of buildings that can meet the criteria of the Phius standards for all climate zones and has passed Phius' examination.

Buildings designed, modeled and constructed to meet the Phius standards are ultra-efficient and characterized by superior indoor air quality, thermal comfort, resilience and durability.

115758

Phius ID

11/09/25

Date Issued

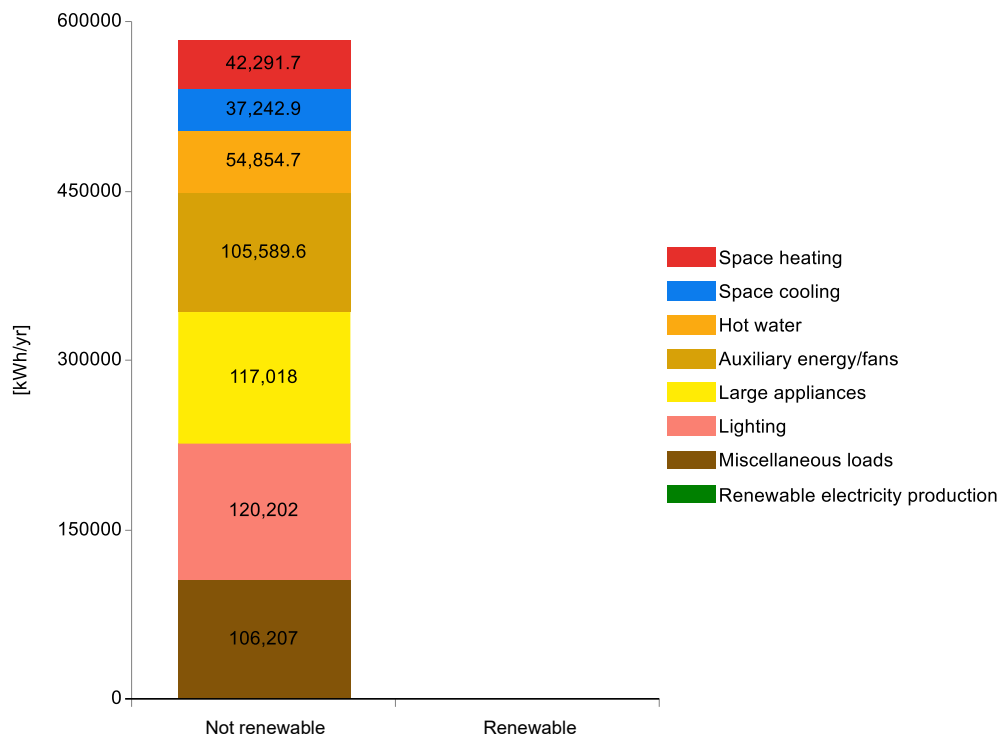
11/09/28

Valid Through

Executive Director

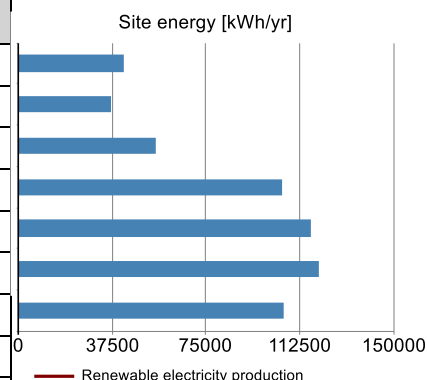
Project name	350 Rindge Avenue - Feasibility Study
Climate	BOSTON LOGAN INT ARPT MA
Type	Residential
Interior conditioned floor area	108,315 ft²
Number of units	91
Occupants	267
Site energy use	1,990,467.2 kBtu/yr
Specific site energy use	18.4 kBtu/ft²yr
Site energy use	583,405.9 kWh/yr
Specific site energy use	5.4 kWh/ft²yr
Site energy use per person	2,185 kWh/Person yr
Net site energy use (with 100% renewables)	1,990,467.2 kBtu/yr
Specific net site energy use (with 100% renewables)	18.4 kBtu/ft²yr
Net site energy use (with 100% renewables)	583,405.9 kWh/yr
Specific net site energy use (with 100% renewables)	5.4 kWh/ft²yr
Net site energy use per person (with 100% renewables)	2,185 kWh/Person yr

OVERVIEW



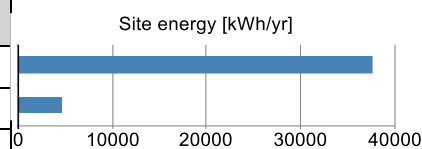
TOTAL USE BY TYPE

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
Space heating	42,291.7	0.4	144,290.9	1.3
Space cooling	37,242.9	0.3	127,065.6	1.2
Hot water	54,854.7	0.5	187,153.4	1.7
Auxiliary energy/fans	105,589.6	1	360,251.3	3.3
Large appliances	117,018	1.1	399,242.7	3.7
Lighting	120,202	1.1	410,105.8	3.8
Miscellaneous loads	106,207	1	362,357.6	3.3
Renewable electricity production	0	0	0	0
Total	583,405.9	5.4	1,990,467.2	18.4



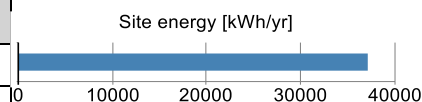
SPACE HEATING

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
Heat pump	37,741.7	0.3	128,767.4	1.2
Electric resistance heating	4,549.9	0	15,523.5	0.1
Total	42,291.7	0.4	144,290.9	1.3



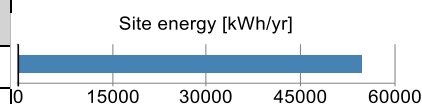
SPACE COOLING

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
Recirculation Cooling	37,242.9	0.3	127,065.6	1.2
Total	37,242.9	0.3	127,065.6	1.2



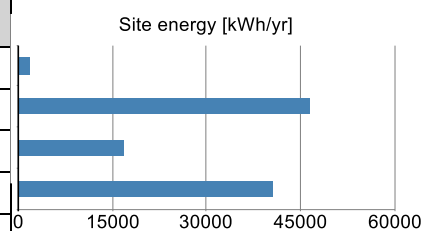
DHW

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
Heat pump	54,854.7	0.5	187,153.4	1.7
Total	54,854.7	0.5	187,153.4	1.7



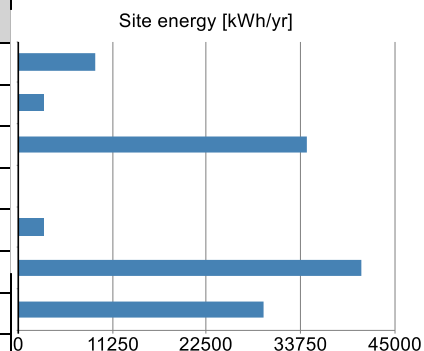
AUXILIARY ENERGY/FANS

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
Other	1,742	0	5,943.4	0.1
Ventilation winter	46,549	0.4	158,816.1	1.5
Ventilation Defrost	16,750.5	0.2	57,149.3	0.5
Ventilation summer	40,548.2	0.4	138,342.5	1.3
Total	105,589.6	1	360,251.3	3.3



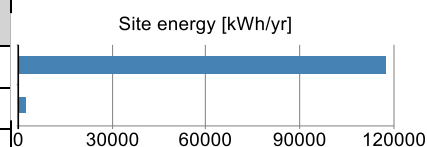
LARGE APPLIANCES

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
Kitchen dishwasher	9,195.6	0.1	31,373.4	0.3
Laundry - washer	2,983.9	0	10,180.6	0.1
Laundry - dryer	34,427.5	0.3	117,460	1.1
Energy consumed by evaporation	0	0	0	0
	(2,944.7)	(0)	(10,046.8)	(0.1)
Kitchen fridge/freeze combo	41,041	0.4	140,023.9	1.3
Kitchen cooking	29,370	0.3	100,204.7	0.9
Total	117,018	1.1	399,242.7	3.7



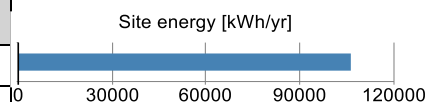
LIGHTING

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
User defined lighting	117,610	1.1	401,262.4	3.7
User defined lighting	2,592	0	8,843.4	0.1
Total	120,202	1.1	410,105.8	3.8



MISC LOADS

Type	Site Energy [kWh/yr]	Specific site energy [kWh/ft ² yr]	Site Energy [kBtu/yr]	Specific Site Energy [kBtu/ft ² yr]
User defined MELs	106,207	1	362,357.6	3.3
Total	106,207	1	362,357.6	3.3



BUILDING INFORMATION

Category:	Residential
Status:	In planning
Building type:	New construction
Year of construction:	
Units:	91
Number of occupants:	267 (Design)
Occupant density:	405.7 ft²/Person

**Boundary conditions**

Climate:	BOSTON LOGAN INT ARPT MA
Internal heat gains:	1.3 Btu/hr ft²
Interior temperature:	68 °F
Overheat temperature:	77 °F

Building geometry

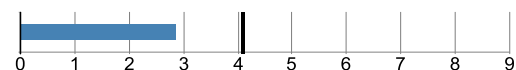
Enclosed volume:	1,384,512.6 ft³
Net-volume:	1,052,229.6 ft³
Total area envelope:	87,118.1 ft²
Area/Volume Ratio:	0.1 1/ft
Floor area:	108,315 ft²
Envelope area/iCFA:	0.804

PASSIVEHOUSE REQUIREMENTS

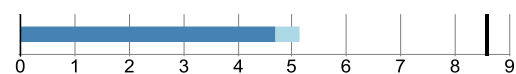
Certificate criteria: **Phius CORE 2021**

Heating demand

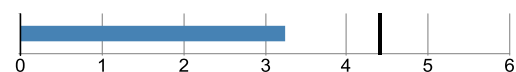
specific:	2.87 kBtu/ft²yr
target:	4.1 kBtu/ft²yr
total:	310,469.65 kBtu/yr

**Cooling demand**

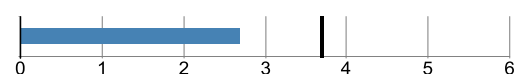
sensible:	4.69 kBtu/ft²yr
latent:	0.45 kBtu/ft²yr
specific:	5.15 kBtu/ft²yr
target:	8.6 kBtu/ft²yr
total:	557,345.25 kBtu/yr

**Heating load**

specific:	3.25 Btu/hr ft²
target:	4.4 Btu/hr ft²
total:	351,752.68 Btu/hr

**Cooling load**

specific:	2.7 Btu/hr ft²
target:	3.7 Btu/hr ft²
total:	292,697.13 Btu/hr



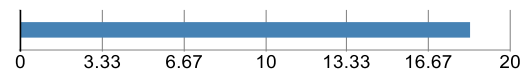
Source energy

total: **1,166,811.88** kWh/yr
specific: **4,370** kWh/Person yr
target: **4,450** kWh/Person yr
total: **3,980,934.42** kBtu/yr
specific: **36.76** kBtu/ft²yr



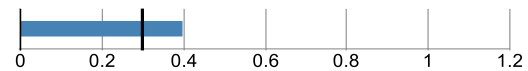
Site energy

total: **1,990,467.21** kBtu/yr
specific: **18.38** kBtu/ft²yr
total: **583,405.94** kWh/yr
specific: **5.39** kWh/ft²



Air tightness

ACH50: **0.4** 1/hr
CFM50 per envelope area: **0.08** cfm/ft²
target: **0.3** 1/hr
target CFM50: **0.06** cfm/ft²

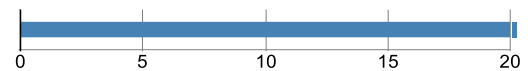


PASSIVEHOUSE RECOMMENDATIONS

Sensible recovery efficiency: **74.8** %



Frequency of overheating: **50.4** %
Cooling system is required

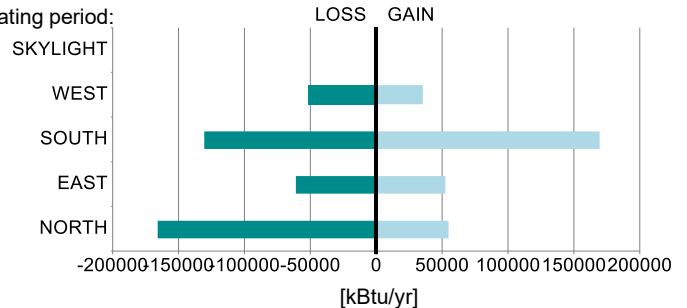


Frequency of overheating only applies if there is not a [properly sized] cooling system installed.

BUILDING ELEMENTS

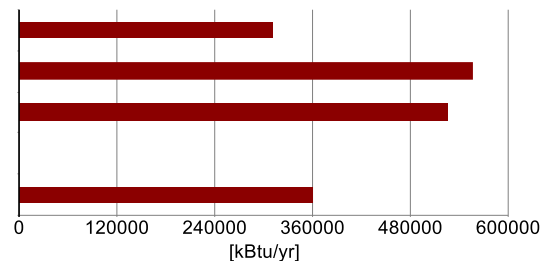
Windows

	Heat gain/loss heating period:	
Average SHGC:	0.41	
Average solar reduction factor heating:	0.44	
Average solar reduction factor cooling:	0.4	
Average U-value:	0.203 Btu/hr ft ² °F	
Total glazing area:	10,139.4 ft ²	
Total window area:	14,288.6 ft ²	



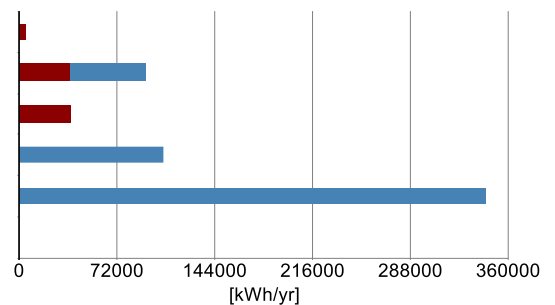
HVAC

Total heating demand:	310,470 kBtu/yr
Total cooling demand:	557,345 kBtu/yr
Total DHW energy demand:	524,655 kBtu/yr
Solar DHW contribution:	0 kBtu/yr
Auxiliary electricity:	360,251 kBtu/yr



Electricity

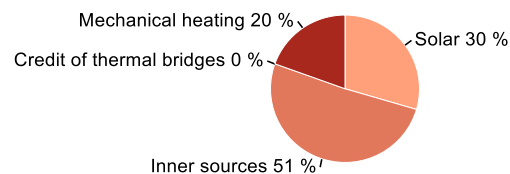
Direct heating / DHW:	4,550 kWh/yr
Heatpump heating:	92,596 kWh/yr
Cooling:	37,243 kWh/yr
HVAC auxiliary energy:	105,590 kWh/yr
Appliances:	343,427 kWh/yr
Renewable generation, coincident production and use:	0 kWh/yr
Total electricity demand:	583,406 kWh/yr



HEAT FLOW - HEATING PERIOD

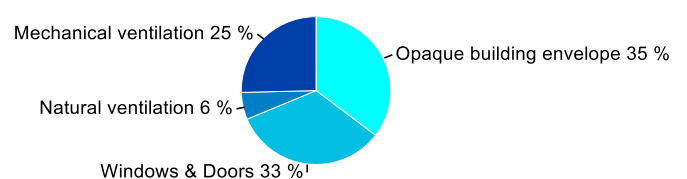
Heat gains

Solar:	388,512 kBtu/yr
Inner sources:	670,259 kBtu/yr
Credit of thermal bridges:	0 kBtu/yr
Mechanical heating:	310,470 kBtu/yr



Heat losses

Opaque building envelope:	483,999 kBtu/yr
Windows & Doors:	456,386 kBtu/yr
Natural ventilation:	81,181 kBtu/yr
Mechanical ventilation:	347,674 kBtu/yr

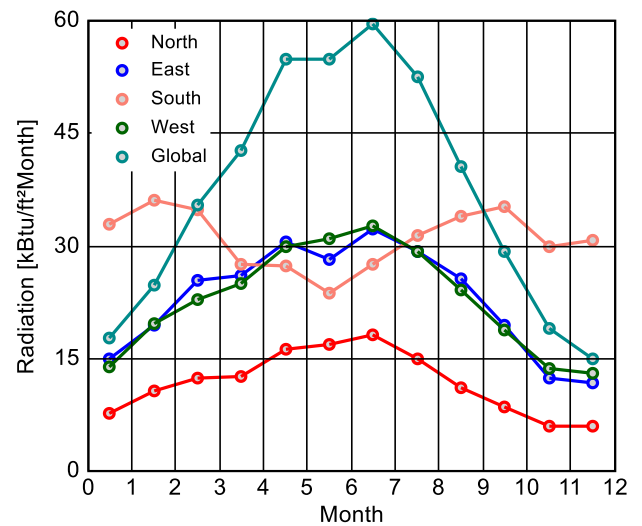
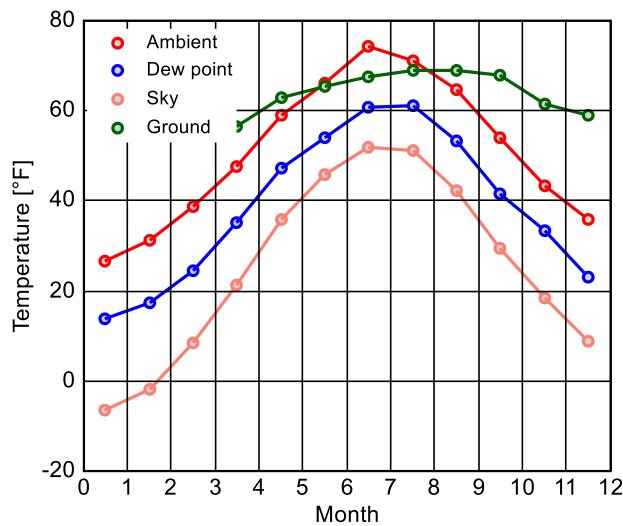


CLIMATE

Latitude: **42.4 °**
 Longitude: **-71 °**
 Elevation of weather station: **19.7 ft**
 Elevation of building site: **16 ft**
 Heat capacity air: **0.018 Btu/ft³F**
 Daily temperature swing summer: **14.8 °F**
 Average wind speed: **13.1 ft/s**

Ground

Average ground surface temperature: **52.8 °F**
 Amplitude ground surface temperature: **55.8 °F**
 Ground thermal conductivity: **1.2 Btu/hr ft °F**
 Ground heat capacity: **29.8 Btu/ft³F**
 Depth below grade of groundwater: **9.8 ft**
 Flow rate groundwater: **0.2 ft/d**



Calculation parameters

Length of heating period: **243 days/yr**
 Heating degree hours: **141.1 kFh/a**
 Phase shift months: **1.3 mths**
 Time constant heating demand: **128 hr**
 Time constant cooling demand: **0 hr**
 Time constant cooling demand with night ventilation: **0 hr**

Climate for	Heating load 1	Heating load 2	Cooling
Temperature [°F]	16.9	31.6	83.5
Solar radiation North [Btu/hr ft²]	12	7.9	27.6
Solar radiation East [Btu/hr ft²]	22.8	13.3	61.5
Solar radiation South [Btu/hr ft²]	49.5	27.3	41.8
Solar radiation West [Btu/hr ft²]	22.2	11.4	53.3
Solar radiation Global [Btu/hr ft²]	26.9	16.5	101.4

Relevant boundary conditions for heating load calculation: Heating load 1

ANNUAL HEAT DEMAND

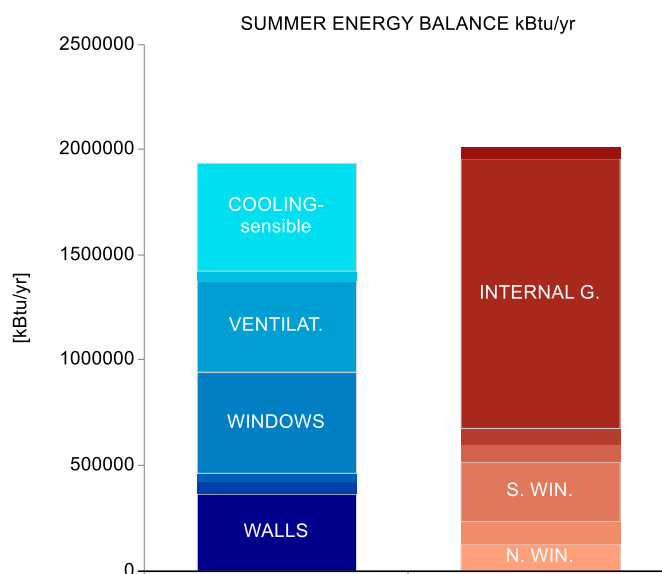
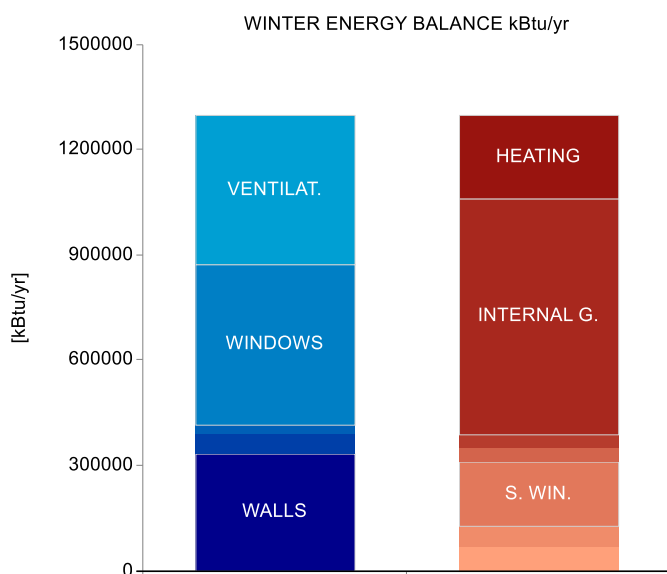
Transmission losses :	940,386 kBtu/yr
Ventilation losses:	428,855 kBtu/yr
Total heat losses:	1,369,241 kBtu/yr
Solar heat gains:	470,059 kBtu/yr
Internal heat gains:	810,942 kBtu/yr
Total heat gains:	1,281,000 kBtu/yr
Utilization factor:	82.7 %
Useful heat gains:	1,058,771 kBtu/yr

Annual heat demand:	310,470 kBtu/yr
Specific annual heat demand:	2,866.6 Btu/ft ² yr

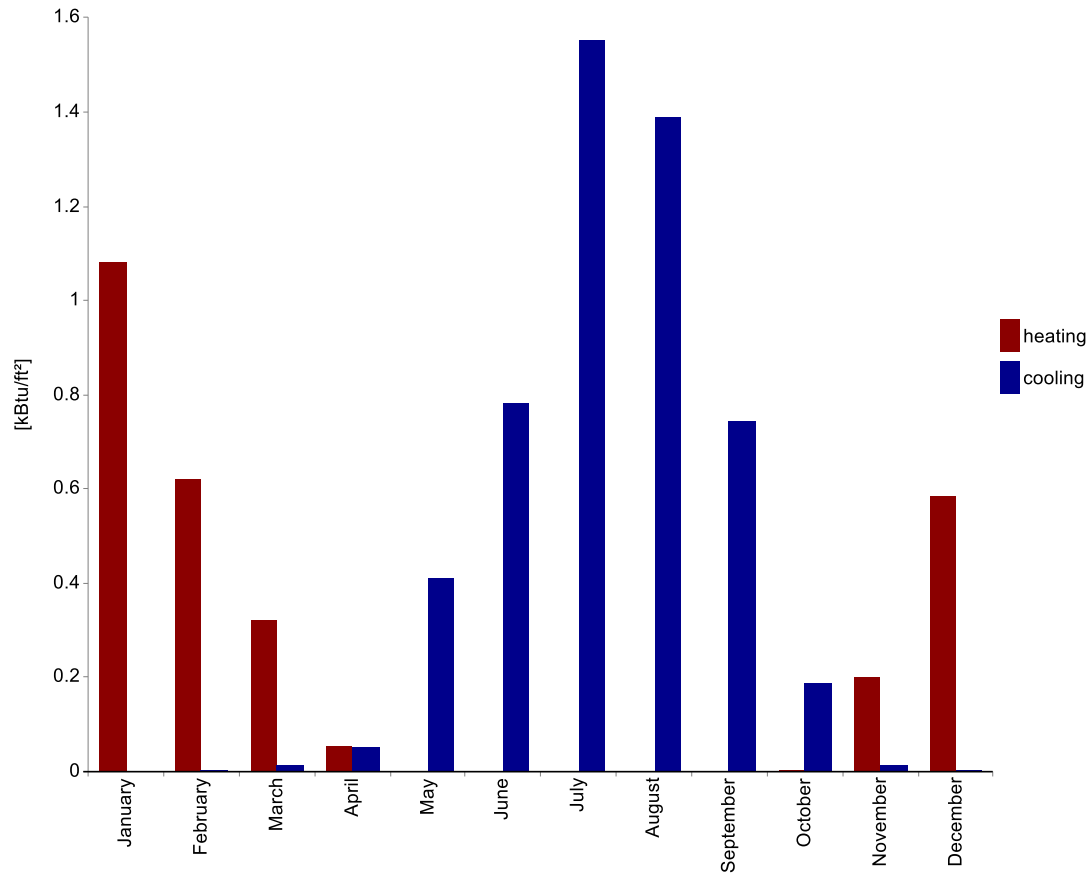
ANNUAL COOLING DEMAND

Solar heat gains:	675,241 kBtu/yr
Internal heat gains:	1,282,109 kBtu/yr
Total heat gains:	1,957,350 kBtu/yr
Transmission losses :	1,471,509 kBtu/yr
Ventilation losses:	620,536 kBtu/yr
Total heat losses:	2,092,046 kBtu/yr
Utilization factor:	69.3 %
Useful heat losses:	1,449,087 kBtu/yr

Cooling demand - sensible:	508,262 kBtu/yr
Cooling demand - latent:	49,083 kBtu/yr
Annual cooling demand:	557,345 kBtu/yr
Specific annual cooling demand:	5.1 kBtu/ft ² yr



SPECIFIC HEAT/COOLING DEMAND MONTHLY



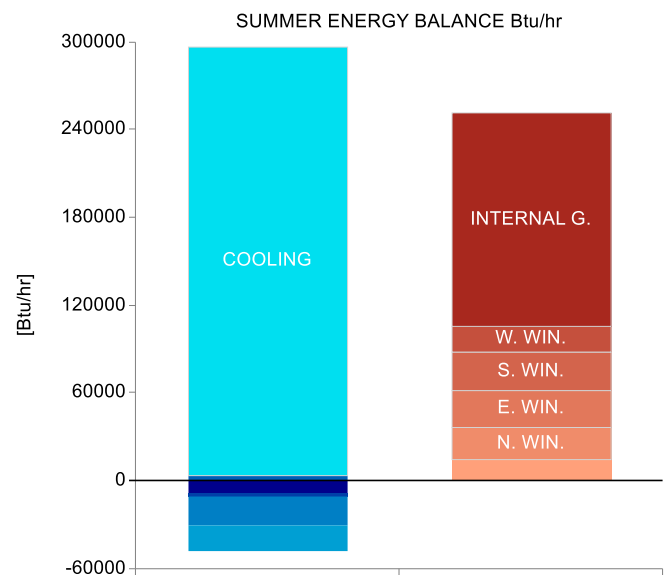
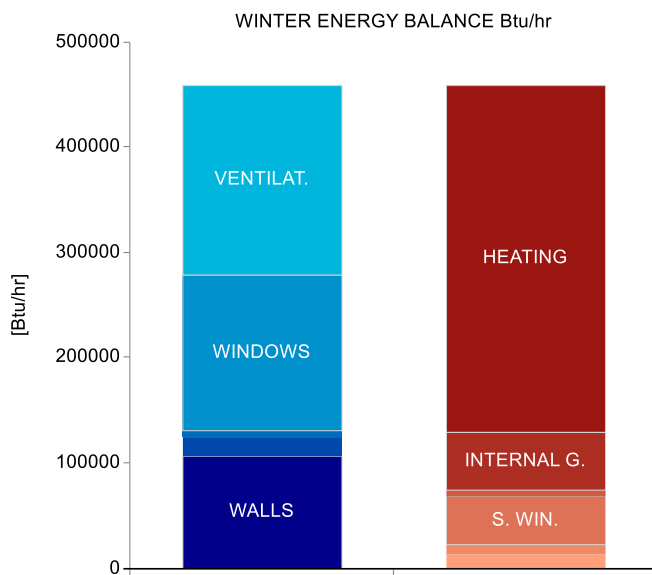
Month	Heating [kBtu/ft²]	Cooling [kBtu/ft²]
January	1.1	0
February	0.6	0
March	0.3	0
April	0.1	0.1
May	0	0.4
June	0	0.8
July	0	1.6
August	0	1.4
September	0	0.7
October	0	0.2
November	0.2	0
December	0.6	0

HEATING LOAD

	First climate	Second climate
Transmission heat losses:	301,626.2 Btu/hr	217,754.7 Btu/hr
Ventilation heat losses:	179,613.4 Btu/hr	127,740.9 Btu/hr
Total heat loss:	481,239.6 Btu/hr	345,495.6 Btu/hr
Solar heat gain:	74,549.9 Btu/hr	42,446.4 Btu/hr
Internal heat gain:	54,937.1 Btu/hr	54,937.1 Btu/hr
Total heat gains heating:	129,486.9 Btu/hr	97,383.4 Btu/hr
Heating load:	351,752.7 Btu/hr	248,112.1 Btu/hr
Relevant heating load:	351,752.7 Btu/hr	
Specific heating load:	3.2 Btu/hr ft ²	

COOLING LOAD

Solar heat gain:	105,317.7 Btu/hr
Internal heat gain:	146,373.8 Btu/hr
Total heat gains cooling:	251,691.6 Btu/hr
Transmission heat losses:	-23,235.4 Btu/hr
Ventilation heat losses:	-17,770.2 Btu/hr
Total heat loss:	-41,005.6 Btu/hr
Cooling load - sensible:	292,697.1 Btu/hr
Cooling load - latent:	0 Btu/hr
Relevant cooling load:	292,697.1 Btu/hr
Specific maximum cooling load:	2.7 Btu/hr ft ²



July 21, 2026

Janay Hull
Senior Associate
Boston Communities
29 Humphries Street
Boston, MA

Re: 350 Rindge Avenue, Cambridge, MA

Dear Janay,

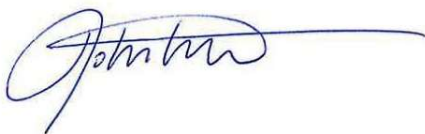
The site at 350 Rindge Avenue does not have any existing trees within the proposed limit of work so we are not required to complete/submit a Tree Study and City Arborist Certification.

The proposed site plan includes the installation of five deciduous shade trees along Rindge Avenue to provide some human scale against the building façade and naturally shaded areas for people to sit and gather. These trees will be planted in a below grade soil cell system to allow for healthy root growth and prolonged tree life. These trees will also help to reduce the effects of Urban Heat Island on the public sidewalks.

On the western side of the building, we are proposing four flowering trees adjacent to a new seating area. At the rear, five more deciduous shade trees are proposed. On three sides of the building, there will be foundation shrub and perennial planting. These plants will help to ground the building within the site, soften the façade, and provide seasonal color and texture.

All plants will be salt and drought tolerant. The overall goal is to plant as many native and pollinator species as we can to help to promote and enhance wildlife and the surrounding ecosystems. We are not proposing irrigation for any of the planted zones.

Regards,
WESTON & SAMPSON

A handwritten signature in blue ink, appearing to read "Johnathan Law", with a long horizontal flourish extending to the right.

Johnathan Law
Senior Team Leader | Landscape Architecture

350 Rindge Avenue Redevelopment

Civil Narrative

Date: 5-29-2026

Civil Infrastructure Narrative

The Proposed project involves redeveloping the 350 Rindge Avenue, Cambridge, MA from three existing dwelling units & 1 existing story structure & associated paved areas used for parking into a 10-story building containing affordable housing units. The site is located on the south side of Rindge Ave, between two adjacent properties.

The existing buildings comprise roughly 8,620 SF of the 22,364 SF site. In addition to the building, the site contains a paved area of approximately 12,667 SF mainly used for parking and. The majority of the site is paved, with the exemption of a small portion on the West side and another small portion on the South of the property with an area of around 2,300 SF of grassed/ unpaved areas. There is two (2) existing driveway curb cuts on Rindge Ave. The site has an existing concrete sidewalk along Rindge Ave.

Elevations on site range from 30.0+/- to 25.1+/- Cambridge City Base (CCB), and the site generally slopes from South-East to North-West towards Rindge Avenue. Existing site features and utilities described in this narrative have been identified and evaluated using the Site Survey performed by Daniel MacIsaac titled "Topographic Plan #335-350&350R Rindge Avenue Cambridge Massachusetts", dated on March 15, 2026, with supplementary information obtained from Cambridge's GIS mapping and the state's website.

Attachments

The following supporting attachments are included herein for reference.

- Figure 1 – Existing Hydrologic Map
- Existing HydroCAD Calculations
- Figure 2 – Proposed Hydrologic Map
- Proposed HydroCAD Calculations
- Civil Plans, dated 5/29/2026

Sanitary Sewer

The existing building sewer ties into the 48" Combined Sewer in Rindge Avenue. A breakdown of the site's existing sanitary sewer flow rates is as follows:

Note: Calculations below are based on the following per 310 CMR 15.000 (Title V), Section 15.203, Type of Establishment:

- Section (2) Residential, Family Dwelling (Multiple) = 110 gallons per day per bedroom
- Section (3) Commercial, Retail Store (except supermarkets) = 50 gallons per day per 1,000 square feet
- Section (3) Commercial, Restaurants, Fast Food = 20 gallons per day per seat

Existing Sewer Generation Estimate

Address: 344, 350, 350R Rindge Avenue

- Use: (15.203 (2)) Residential, Family Dwelling (Multiple)
 - Bedrooms: 8-total per Assessor's Information
 - GPD (per Title 5): 110 gpd per bedroom
 - Estimated Average Daily Flow: 880 gpd

Address: 336 Rindge Avenue

- Use: (15.203 (3)) Commercial, Retail Store
 - Area: 5,325 square feet per Assessor's Information
 - GPD (per Title 5): 50 gpd per 1,000 square feet
 - Estimated Average Daily Flow: 266 gpd
- Use: (15.203 (3)) Restaurants, Fast Food
 - Seats: 18 seats
 - GPD (per Title 5): 20 gpd per seat
 - Estimated Average Daily Flow: 360 gpd

Total Estimated Existing Average Daily Flow: 1,506 gpd

The Sanitary Sewage from the proposed building will be collected in the new onsite sewer infrastructure and discharge into the existing 48" Combined Sewer system on Rindge Avenue. A breakdown of the site's Proposed Sanitary Sewer design flow rates are as follows:

Proposed Sewer Generation Estimate

Residential Use:

- Use: (15.203 (2)) Residential, Family Dwelling, Multiple
 - Bedrooms: 175 total per PCA plans
(and unit mix shown hereon)
 - GPD (per Title 5): 110 gpd per bedroom
 - Estimated Average Daily Flow: 19,250 gpd

Retail Use:

- Use: (15.203 (3)) Commercial, Retail Store
 - Area: 4,589 square feet per PCA plans
 - GPD (per Title 5): 50 gpd per 1,000 square feet
 - Estimated Average Daily Flow: 230 gpd

Total Estimated Proposed Average Daily Flow: 19,480 gpd

10 story option				
	1BR	2BR	3BR	TOTAL
L1	0	0	0	0
L2	4	3	4	11
L3	4	4	1	9
L4	5	4	2	11
L5	5	4	2	11
L6	3	4	3	10
L7	3	4	3	10
L8	3	4	3	10
L9	3	4	3	10
L10	3	4	3	10
TOTAL	33	35	24	92
	35.9%	38.0%	26.1%	

Sewer Generation Summary

- Total Estimated Existing Average Daily Flow (sewer generation): 1,506 gpd
- Total Estimated Proposed Average Daily Flow (sewer generation): 19,480 gpd
- Net Increase (sewer generation): 17,974 gpd

Net increase (17,974 gpd) > than 15,000 gpd, and therefore, exceeds the I/I threshold for this project.

Mitigation required (4:1 ratio): 4 x 17,974 gpd (net increase) = 71,896 gallons

Proposed I/I Reduction (from proposed onsite Stormwater Management Systems)

Guidance from the City of Cambridge provided on 4-30-26 noting the following: "the design storm for the estimation of I/I removed from stormwater management systems is the 1yr 6-hour event, at 1.72" of Depth"

- **Infiltration System #1 (IS1) – South**

Excerpt from Preliminary Hydrology Model (recharge volume noted below with 1-yr 6-hour event modeled):

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 0.98" for 1y-6hours event
 Inflow = 0.27 cfs @ 12.08 hrs, Volume= 914 cf
 Outflow = 0.08 cfs @ 12.40 hrs, Volume= 914 cf, Atten= 70%, Lag= 19.1 min
 Discarded = 0.08 cfs @ 12.40 hrs, Volume= 914 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 22.88' @ 12.40 hrs Surf.Area= 1,361 sf Storage= 153 cf

Plug-Flow detention time= 9.1 min calculated for 914 cf (100% of inflow)
 Center-of-Mass det. time= 9.1 min (783.9 - 774.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7'W x 35.4'H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7'W x 35.4'H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

- **Infiltration System #2 (IS2) - North**

Excerpt from Preliminary Hydrology Model (recharge volume noted below with 1-yr 6-hour event modeled):

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 0.56" for 1y-6hours event
 Inflow = 0.27 cfs @ 12.08 hrs, Volume= 904 cf
 Outflow = 0.12 cfs @ 12.28 hrs, Volume= 904 cf, Atten= 57%, Lag= 11.5 min
 Discarded = 0.12 cfs @ 12.28 hrs, Volume= 904 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 23.33' @ 12.28 hrs Surf.Area= 549 sf Storage= 93 cf

Plug-Flow detention time= 3.3 min calculated for 904 cf (100% of inflow)
 Center-of-Mass det. time= 3.3 min (774.8 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7'W x 35.4'H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7'W x 35.4'H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Stormwater Recharge Summary

- *Total Estimated Proposed Recharge Volume (from HydroCAD model above): 1,818-cf or **13,600 gallons***
- *Remaining inflow-infiltration volume mitigation required after onsite stormwater recharge:*

$$\begin{aligned} &71,896 \text{ gpd (total I/I required)} \\ &\text{- } 13,600 \text{ gallons (stormwater recharge volume onsite)} \\ &= 58,296 \text{ gpd} \end{aligned}$$

Domestic Water and Fire Protection Service

The Project's water demand estimate for domestic services is based on the project's estimated sewage generation, described above. A conservative factor of 1.1 (10%) is applied to the estimated average daily wastewater flows calculated with 310 CMR 15.203 values to account for consumption, system losses and other usages to estimate an average water demand is **14,911** gallons per day. The project proposes installing new domestic and fire protection services that connect to the city water lines in Rindge Ave in accordance with the Cambridge Water Department regulations and requirements.

A hydrant flow test will be completed to determine pressure in the existing water main (16" W) to determine if a fire pump will be needed to provide the required pressure for the building sprinkler's system. The fire protection system will be coordinated with the City Fire Chief, and all water service connections will be fully coordinated with the City Water Department. An existing fire hydrant is located across Rindge Avenue from the site and is to remain.

Stormwater Management and Drainage Design

The proposed site stormwater management system has been designed in accordance with the Massachusetts Stormwater Handbook and the City of Cambridge Stormwater Management Standards.

As noted above, the existing site generally slopes from southeast to northwest and currently provides no stormwater peak rate or volume attenuation, nor any water quality treatment. Existing runoff sheet flows untreated to Rindge Avenue, where it enters the existing 48-inch combined sewer system.

The City of Cambridge requires compliance with the "25-to-2" peak rate reduction standard using 2070 design storm values, as well as stormwater quality treatment requirements. To meet these standards, the project proposes two underground R-Tank infiltration systems (IS-1 and IS-2). Due to site constraints and limited available space, IS-1 will be located along the south side of the property and will not meet the required 10-foot setback from the property line and building foundation. Similarly, IS-2 will be located along the northeast side of the property and will also not meet the required 10-foot setback from the property line and building foundation.

The proposed systems will be coordinated with the building plumbing design to collect, store, and gradually infiltrate stormwater runoff from the roof. In addition, two proposed yard drains will collect runoff from the site and convey it to the infiltration systems for treatment and infiltration.

Overflow from both infiltration systems will discharge to the existing 48-inch combined sewer system within Rindge Avenue.

Soil Conditions

Subsurface explorations were conducted by Weston & Sampson in April 2026. A total of three (3) test pits were excavated across the site.

Test Pits TP#1 and TP#2 were located in the southern portion of the property. In TP#1, mottling was observed at approximately elevation 19.7', with roughly 5 feet of fill overlying the native soils, followed by approximately 2.5 feet of loamy sand and 2.5 feet of sandy loam. In TP#2, mottling was observed at approximately elevation 20.5', with about 7.5 feet of fill above approximately 2.5 feet of sandy loam.

Test Pit TP#3 was located on the northern portion of the site, where approximately 4 feet of fill was observed over a 5-foot layer of sand. Mottling was identified at approximately elevation 20.9'.

Infiltration testing performed within the footprint of the proposed subsurface system (IS-1) on the South Side of the property (TP#1 & tp#2) indicated that the fill and sand materials correspond to Hydrologic Soil Group (HSG) A, reflecting good infiltrative capacity. Based on values provided in the Massachusetts Stormwater Handbook, HSG A (Loamy Sand) soils are assigned an infiltration rate of approximately 2.41 in/hr.

Infiltration testing performed within the footprint of the proposed subsurface system (IS-2) on the North Side of the property (TP#3) indicated that the fill and sand materials also correspond to Hydrologic Soil Group (HSG) A, reflecting great infiltration capacity. Based on values provided in the Massachusetts Stormwater Handbook, HSG A (Sand) soils are assigned an infiltration rate of approximately 8.27 in/hr.

Estimated Seasonal High Groundwater (ESHGW) was determined to be approximately 5.8 feet below existing grade (elevation ~20.5') on the South Side of the Property and about 6 feet below existing grade (Elevation ~20.9') on the North side of the property. The proposed design maintains a minimum two-foot separation between the bottom of the infiltration system and the ESHGW, in accordance with allowable guidance under the Massachusetts Stormwater Handbook.

A groundwater mounding analysis will be submitted prior to construction to demonstrate that the proposed system will not result in adverse mounding impacts to groundwater conditions.

Land Coverage

Development of the site results in an overall decrease of impervious surfaces by approximately 4,000 SF. A breakdown of existing and proposed land use is as follows:

Table 1. Pre- and Post- Land Use For 350 Rindge Avenue (SF)

	Total	Building	Site Impervious	Landscaped
Existing	22,364 SF	8,620 SF	21,025 SF	1,126 SF
Proposed	22,364 SF	14,499 SF	18,501 SF	3,913 SF
Change	---	+5,879 SF	-2,524 SF	+2,787 SF

Peak Runoff Rates

The project is collecting the entire roof area (a majority of the site) and directing it to the underground infiltration system that will reduce peak rates of the site and meet the Cambridge requirement of matching or improving upon the proposed 25-year peak runoff to the existing 2-year peak runoff for the Cambridge 2070 Storms. Below is a table demonstrating the pre- and post- construction runoff values:

Table 2. Pre- and Post- Construction Peak Rates for Rindge Ave (cfs)

	2-year	10-year	25-year	100-year
Existing	1.40	2.52	3.28	4.74
Proposed	0.16	0.75	1.08	1.83

Groundwater Recharge

The annual recharge from the post-development site will approximate the annual recharge from pre-development conditions using the guidelines provided in the MassDEP Stormwater Management Handbook. The guidelines are based on soil type and the Project Site is HSG A type soil.

- Existing Impervious Area = 21,025 SF
- Existing Pervious Area = 2,289 SF
- Proposed Impervious Area = 18,501 SF
- Proposed Pervious Area = 4,813 SF

Required Recharge Volume $R_v = 1 \text{ in} \times 18,501 \text{ SF} \times 1'/12" = 1,542 \text{ CF}$

Provided Recharge Volumes:

- Infiltration System 1 (IS-1) = 1,995 CF
- Infiltration System 2 (IS-2) = 472 CF

Total Provided Recharge Volume = 2,467 CF

A minimum of two feet separation has been maintained between the bottom of the infiltration system and seasonal high groundwater. In conclusion, the Project has been designed to meet, and in some cases, exceed, the MassDEP Stormwater Standards as well as the City of Cambridge's Stormwater requirements.

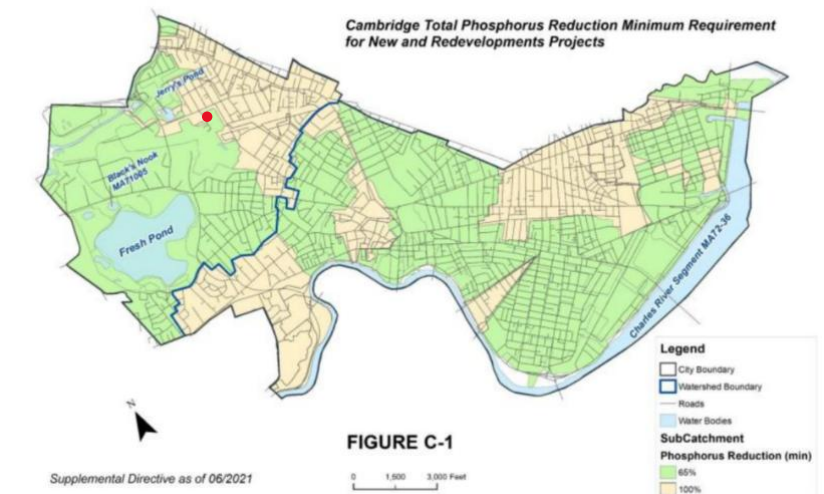
Water Quality

The proposed project provides water quality improvements through the conversion of existing paved areas to primarily building roof area, which generates a lower pollutant load, as well as through an overall reduction of approximately 4,000 SF of impervious area. In addition, the proposed infiltration system provides treatment for the first 1-inch of runoff, resulting in significant phosphorus and TSS removal for runoff directed to the system.

This project is located within the Yellow Zone, denoted requiring 100% Phosphorus Removal, as shown on "Figure C-1 – TP Removal Requirement based on the City of Cambridge Total Phosphorous Reduction Minimum Requirement for New and Redevelopment Projects".

A phosphorus reduction credit of 100% is achieved when 1- inch of runoff is recharged in accordance with the applicable stormwater standards. The project has been preliminary designed to meet this requirement.

Figure C-1. TP Removal Requirement

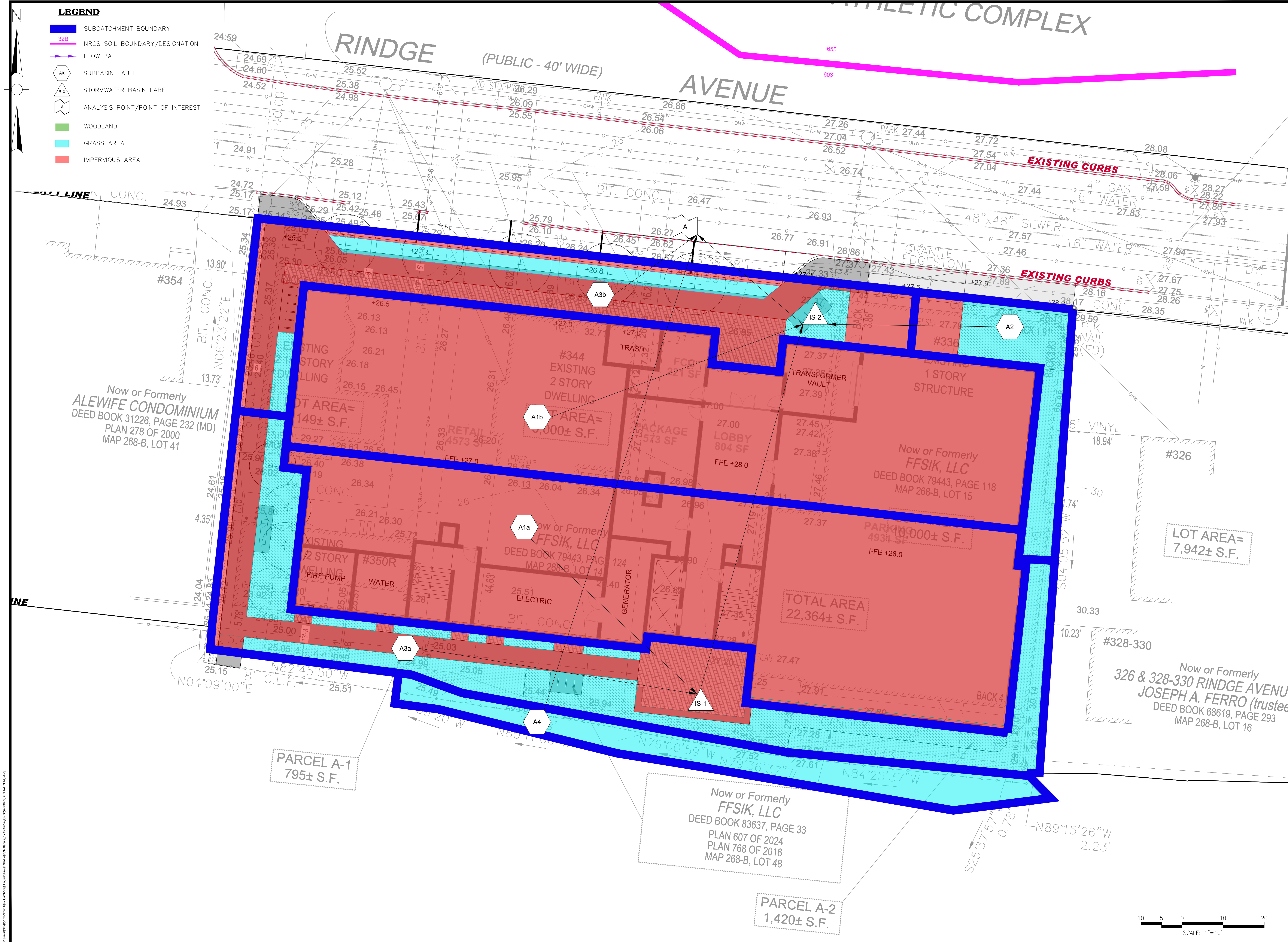


Flood Resiliency

Based on the City of Cambridge Flood Viewer 2025, a limited portion of the site is shown within the projected 2070 Sea Level Rise/ Storm Surge (SLR/ SS) 1% annual chance flood extent. The associated Long-Term Flood Elevation (1% LTFE) for this location is 23.3 feet (CCB datum). Topographic data indicates that ground elevations within the referenced portion of the site range from approximately 25.1 to 30.0 (CCB datum), which are above the projected LTFE. Accordingly, the site is topographically higher than the modeled 2070 1% SLR/SS flood elevation, and the existing/proposed building footprint is not anticipated to experience inundation under this future climate scenario. The proposed building will be designed to establish habitable spaces above the 1% LTFE of elevation 23.3 (CCB datum). Site grading, stairs and ramping are required to meet these standards but will support the renovation providing housing that will be resilient to future projected flood events.



Source: City of Cambridge Flood Viewer 2025



LEGEND

- SUBCATCHMENT BOUNDARY
- NRCS SOIL BOUNDARY/DESIGNATION
- FLOW PATH
- SUBBASIN LABEL
- STORMWATER BASIN LABEL
- ANALYSIS POINT/POINT OF INTEREST
- WOODLAND
- GRASS AREA
- IMPERVIOUS AREA

Project:

BOSTON COMMUNITIES

350 RINDGE AVE.
CAMBRIDGE, MA

Weston & Sampson

Weston & Sampson Engineers, Inc.
1 Washington Street, 10th Floor
Boston, MA 02108
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

COA:

Seal:

Issued For:

REVIEW

Scale: 1"=10'

Date: MAY 29, 2026

Drawn By: ED

Reviewed By: MY

Approved By: JJ

W&S Project No.: ENG26-0124

W&S File No.:

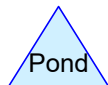
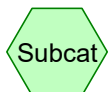
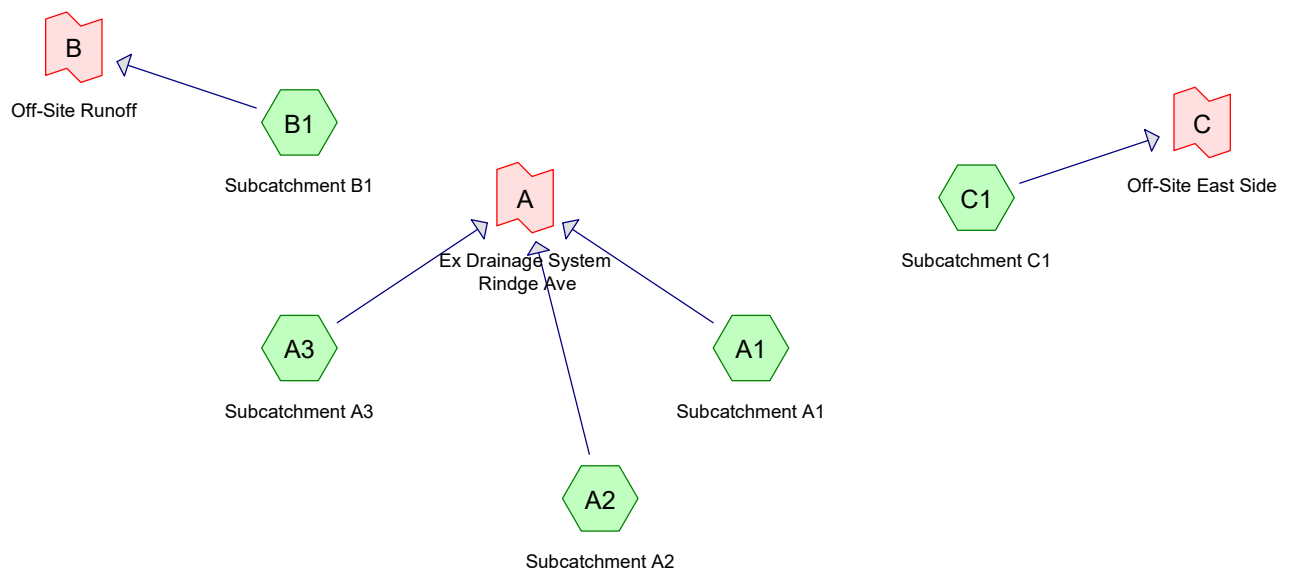
Drawing Title:

PROPOSED
HYDROLOGIC
MAP

Sheet Number:

FIG-2

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Routing Diagram for EX-HYDRO

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EX-HYDRO

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.65	2
2	10-year	Type III 24-hr		Default	24.00	1	6.40	2
3	25-year	Type III 24-hr		Default	24.00	1	8.22	2
4	100-year	Type III 24-hr		Default	24.00	1	11.70	2
5	wqv	Type III 24-hr		Default	24.00	1	1.20	2

EX-HYDRO

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,289	39	>75% Grass cover, Good, HSG A (A2, A3, B1)
1,917	98	Roofs & Paved parkings (B1)
2,212	98	Roofs and Paved parking (C1)
16,896	98	Roofs and Paved parkings (A1, A2)
23,314	92	TOTAL AREA

EX-HYDRO

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
2,289	HSG A	A2, A3, B1
0	HSG B	
0	HSG C	
0	HSG D	
21,025	Other	A1, A2, B1, C1
23,314		TOTAL AREA

EX-HYDRO

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	S N
2,289	0	0	0	0	2,289	>75% Grass cover, Good	
0	0	0	0	1,917	1,917	Roofs & Paved parkings	
0	0	0	0	2,212	2,212	Roofs and Paved parking	
0	0	0	0	16,896	16,896	Roofs and Paved parkings	
2,289	0	0	0	21,025	23,314	TOTAL AREA	

EX-HYDRO*Type III 24-hr 2-year Rainfall=3.65"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Subcatchment A1	Runoff Area=5,709 sf 100.00% Impervious Runoff Depth=3.42" Tc=6.0 min CN=98 Runoff=0.47 cfs 1,625 cf
Subcatchment A2: Subcatchment A2	Runoff Area=11,811 sf 94.72% Impervious Runoff Depth=3.09" Tc=6.0 min CN=95 Runoff=0.92 cfs 3,038 cf
Subcatchment A3: Subcatchment A3	Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.02" Tc=6.0 min CN=39 Runoff=0.00 cfs 2 cf
Subcatchment B1: Subcatchment B1	Runoff Area=2,419 sf 79.25% Impervious Runoff Depth=2.23" Tc=6.0 min CN=86 Runoff=0.15 cfs 450 cf
Subcatchment C1: Subcatchment C1	Runoff Area=2,212 sf 100.00% Impervious Runoff Depth=3.42" Tc=6.0 min CN=98 Runoff=0.18 cfs 630 cf
Link A: Ex Drainage System Rindge Ave	Inflow=1.39 cfs 4,665 cf Primary=1.39 cfs 4,665 cf
Link B: Off-Site Runoff	Inflow=0.15 cfs 450 cf Primary=0.15 cfs 450 cf
Link C: Off-Site East Side	Inflow=0.18 cfs 630 cf Primary=0.18 cfs 630 cf
Total Runoff Area = 23,314 sf Runoff Volume = 5,744 cf Average Runoff Depth = 2.96" 9.82% Pervious = 2,289 sf 90.18% Impervious = 21,025 sf	

EX-HYDRO

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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment A1: Subcatchment A1

Runoff = 0.47 cfs @ 12.08 hrs, Volume= 1,625 cf, Depth= 3.42"

Routed to Link A : Ex Drainage System Rindge Ave

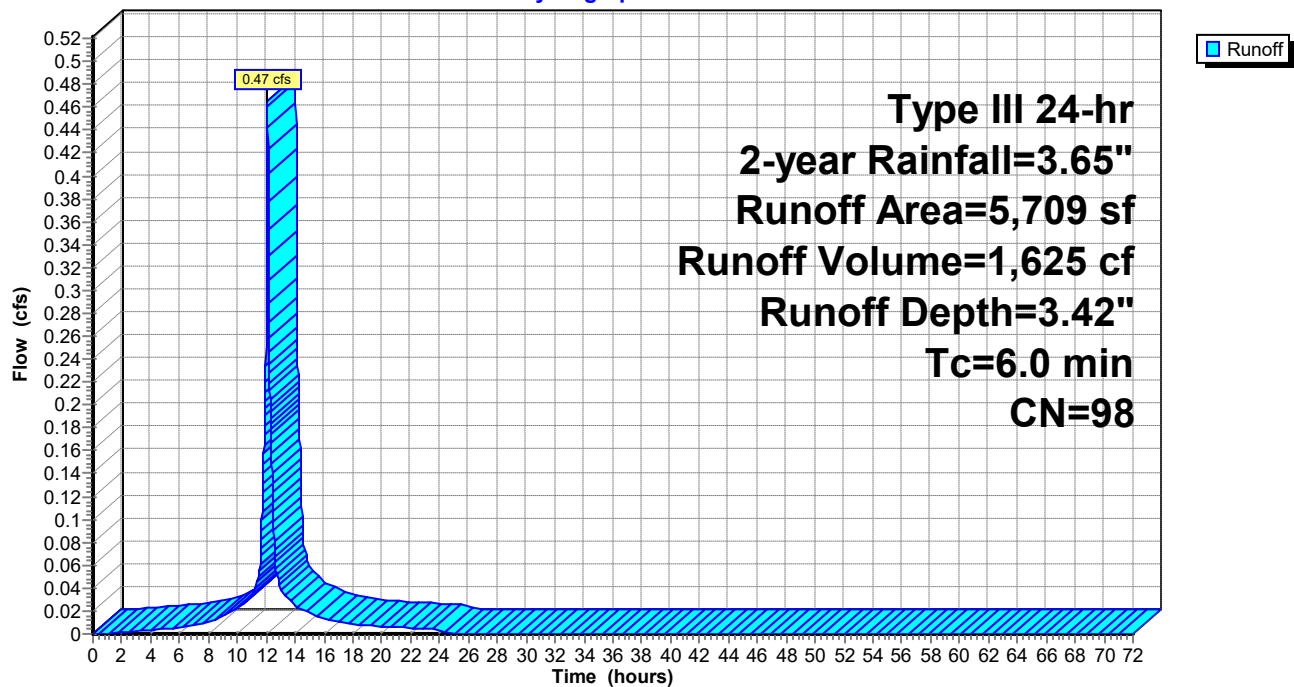
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

	Area (sf)	CN	Description
*	5,709	98	Roofs and Paved parkings
	5,709		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1: Subcatchment A1

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment A2: Subcatchment A2

Runoff = 0.92 cfs @ 12.08 hrs, Volume= 3,038 cf, Depth= 3.09"

Routed to Link A : Ex Drainage System Rindge Ave

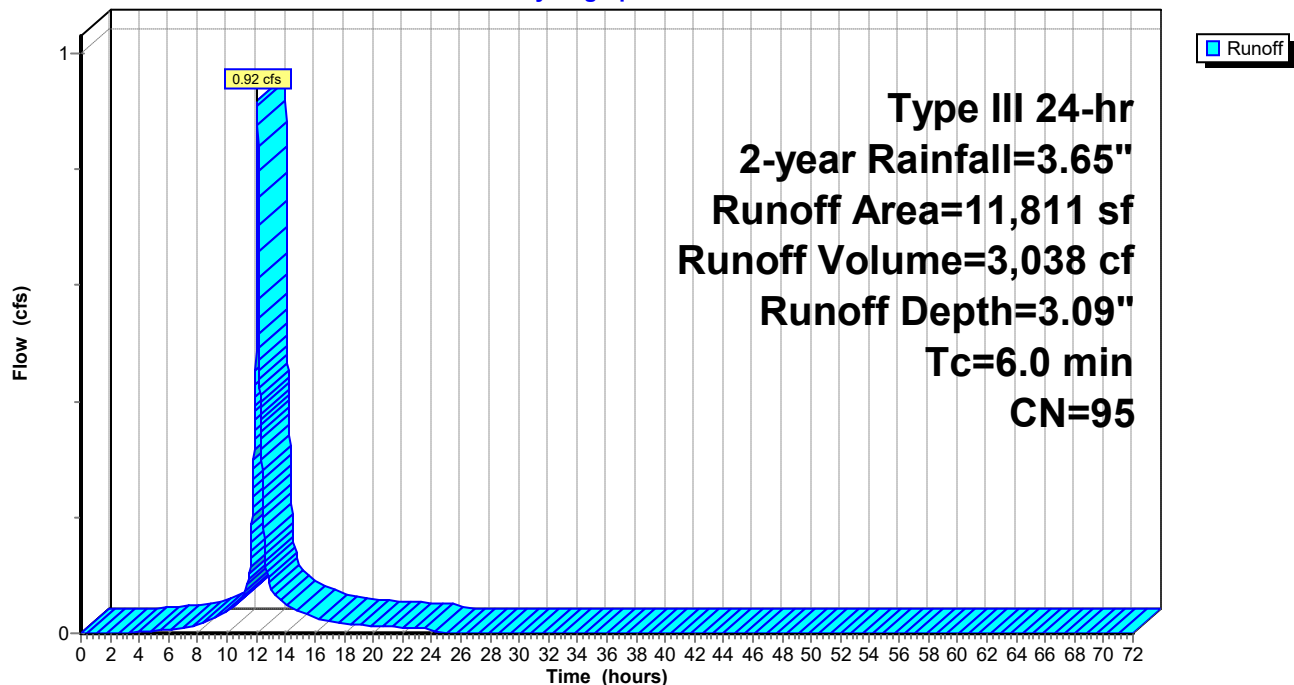
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

	Area (sf)	CN	Description
*	11,187	98	Roofs and Paved parkings
	624	39	>75% Grass cover, Good, HSG A
	11,811	95	Weighted Average
	624		5.28% Pervious Area
	11,187		94.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Summary for Subcatchment A3: Subcatchment A3

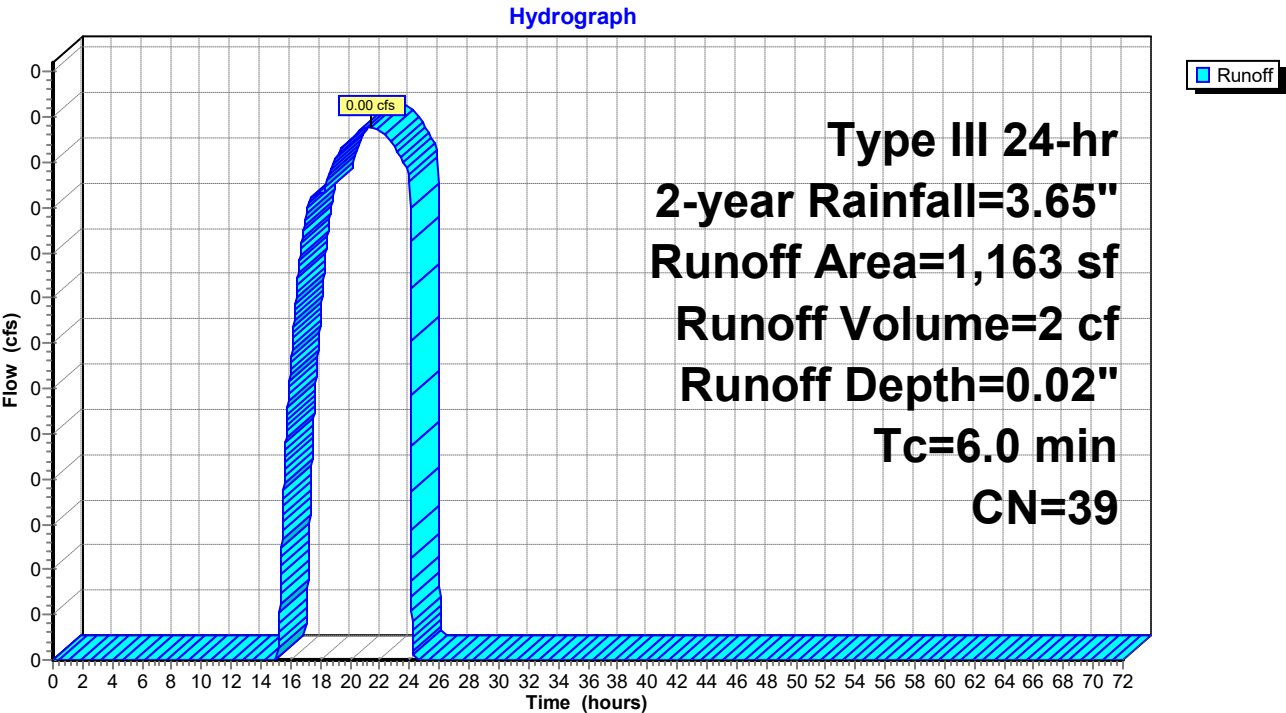
Runoff = 0.00 cfs @ 21.34 hrs, Volume= 2 cf, Depth= 0.02"
Routed to Link A : Ex Drainage System Rindge Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3: Subcatchment A3



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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment B1: Subcatchment B1

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 450 cf, Depth= 2.23"
Routed to Link B : Off-Site Runoff

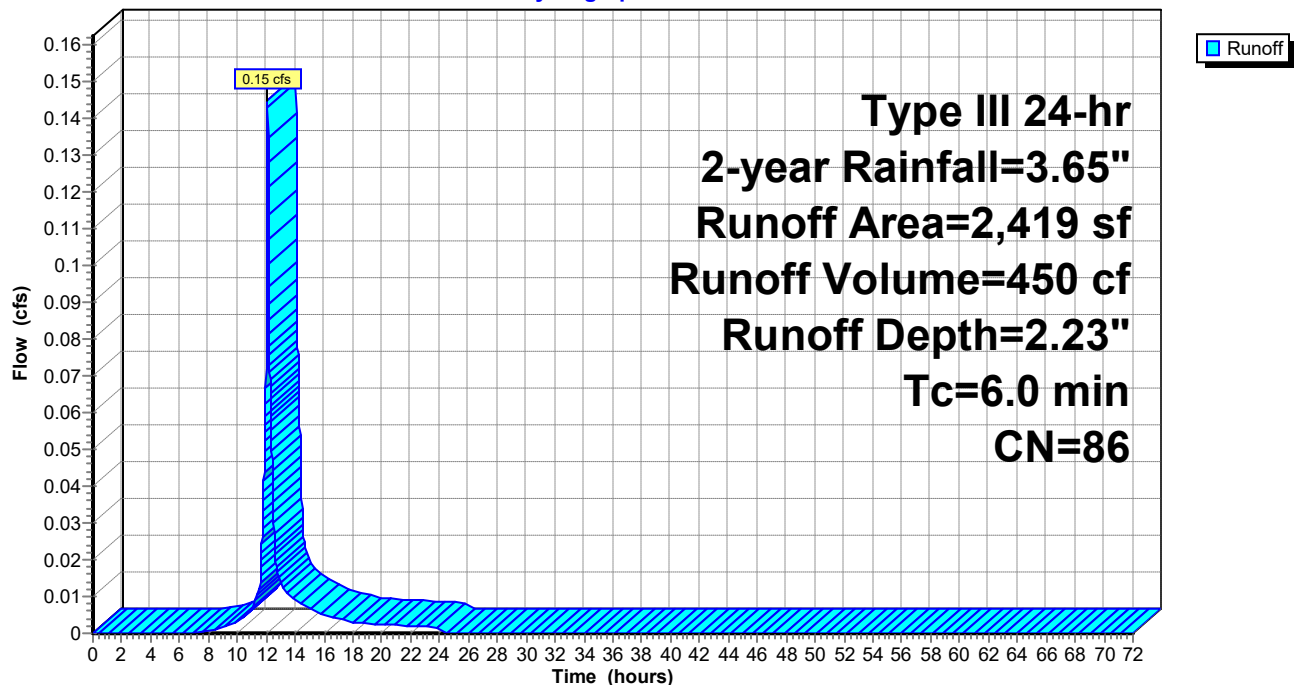
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

	Area (sf)	CN	Description
*	1,917	98	Roofs & Paved parkings
	502	39	>75% Grass cover, Good, HSG A
	2,419	86	Weighted Average
	502		20.75% Pervious Area
	1,917		79.25% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, TC

Subcatchment B1: Subcatchment B1

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment C1: Subcatchment C1

Runoff = 0.18 cfs @ 12.08 hrs, Volume= 630 cf, Depth= 3.42"
Routed to Link C : Off-Site East Side

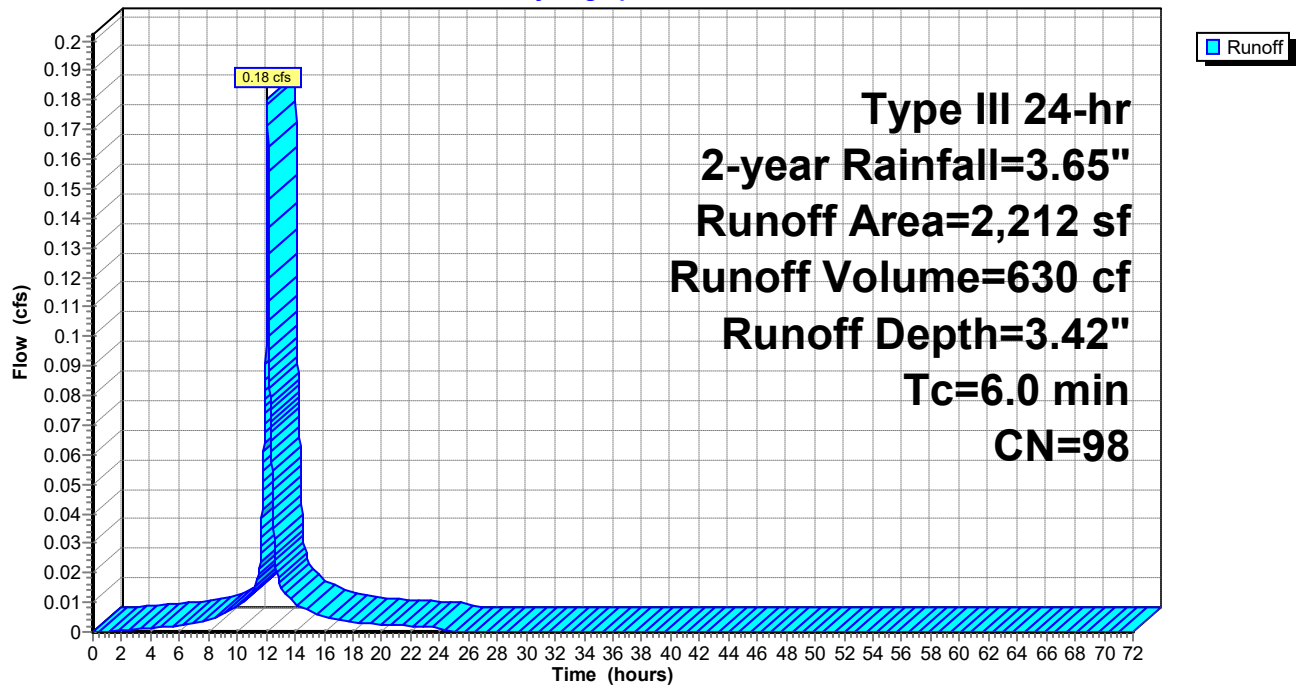
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

	Area (sf)	CN	Description
*	2,212	98	Roofs and Paved parking
	2,212		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment C1: Subcatchment C1

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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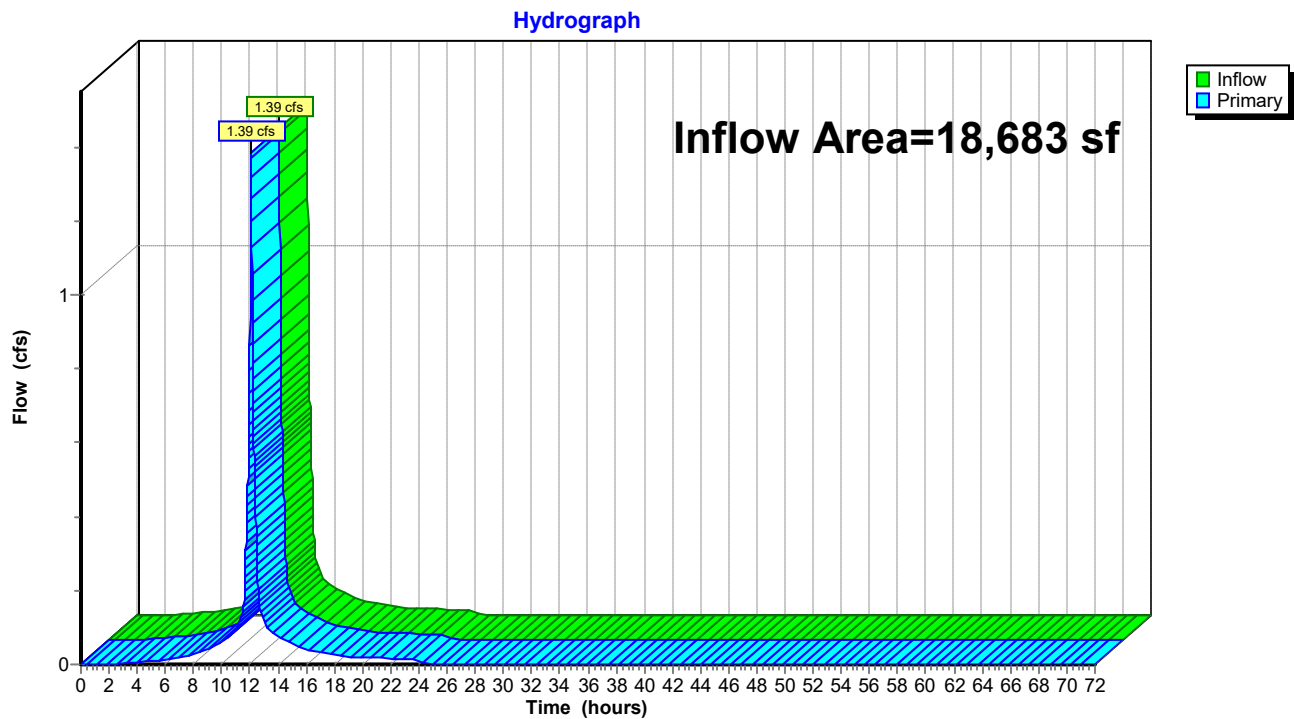
Page 12

Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 18,683 sf, 90.44% Impervious, Inflow Depth = 3.00" for 2-year event
Inflow = 1.39 cfs @ 12.08 hrs, Volume= 4,665 cf
Primary = 1.39 cfs @ 12.08 hrs, Volume= 4,665 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave



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Type III 24-hr 2-year Rainfall=3.65"

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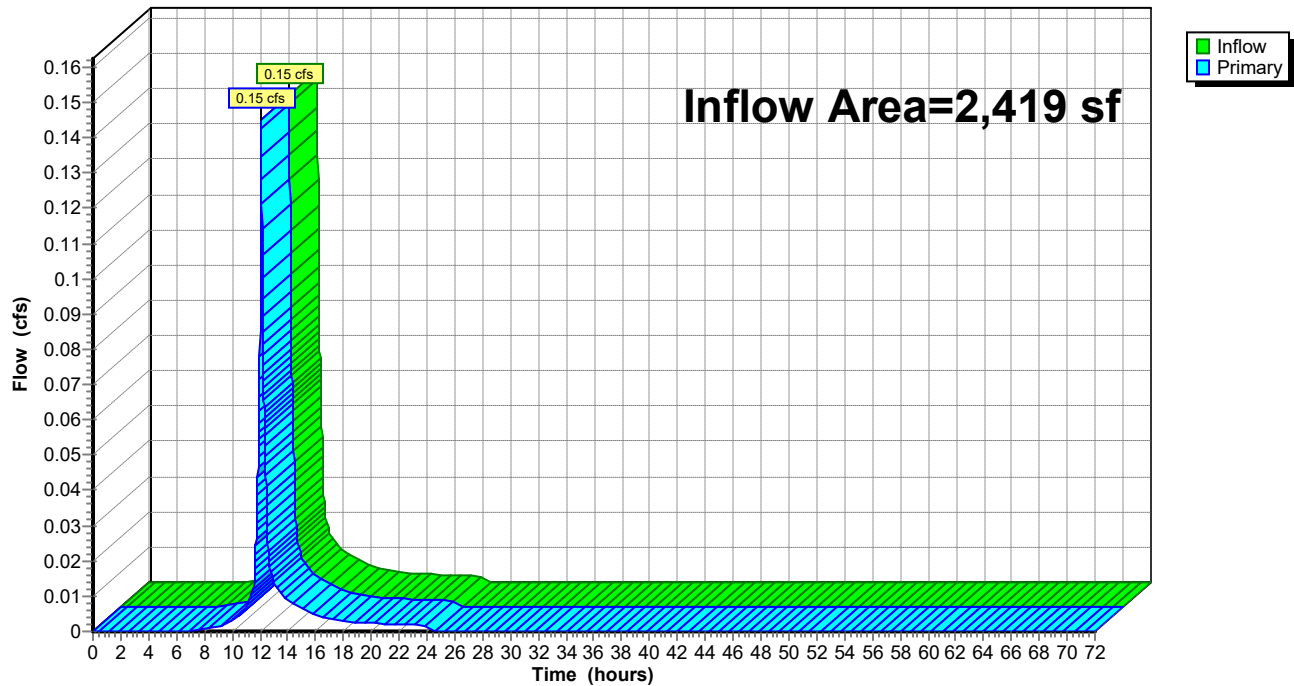
Summary for Link B: Off-Site Runoff

Inflow Area = 2,419 sf, 79.25% Impervious, Inflow Depth = 2.23" for 2-year event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 450 cf
Primary = 0.15 cfs @ 12.09 hrs, Volume= 450 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: Off-Site Runoff

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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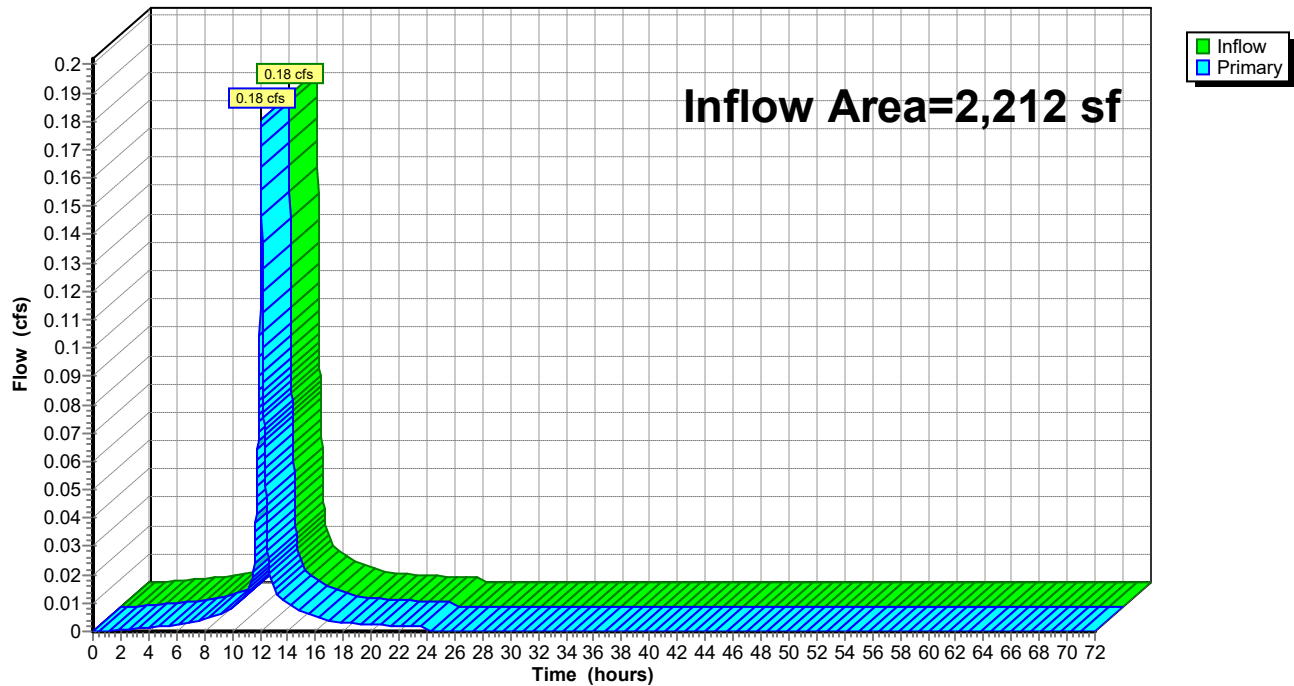
Summary for Link C: Off-Site East Side

Inflow Area = 2,212 sf, 100.00% Impervious, Inflow Depth = 3.42" for 2-year event
Inflow = 0.18 cfs @ 12.08 hrs, Volume= 630 cf
Primary = 0.18 cfs @ 12.08 hrs, Volume= 630 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link C: Off-Site East Side

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Subcatchment A1	Runoff Area=5,709 sf 100.00% Impervious Runoff Depth=6.16" Tc=6.0 min CN=98 Runoff=0.82 cfs 2,931 cf
Subcatchment A2: Subcatchment A2	Runoff Area=11,811 sf 94.72% Impervious Runoff Depth=5.81" Tc=6.0 min CN=95 Runoff=1.67 cfs 5,718 cf
Subcatchment A3: Subcatchment A3	Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.57" Tc=6.0 min CN=39 Runoff=0.01 cfs 55 cf
Subcatchment B1: Subcatchment B1	Runoff Area=2,419 sf 79.25% Impervious Runoff Depth=4.79" Tc=6.0 min CN=86 Runoff=0.30 cfs 966 cf
Subcatchment C1: Subcatchment C1	Runoff Area=2,212 sf 100.00% Impervious Runoff Depth=6.16" Tc=6.0 min CN=98 Runoff=0.32 cfs 1,136 cf
Link A: Ex Drainage System Rindge Ave	Inflow=2.50 cfs 8,704 cf Primary=2.50 cfs 8,704 cf
Link B: Off-Site Runoff	Inflow=0.30 cfs 966 cf Primary=0.30 cfs 966 cf
Link C: Off-Site East Side	Inflow=0.32 cfs 1,136 cf Primary=0.32 cfs 1,136 cf
Total Runoff Area = 23,314 sf Runoff Volume = 10,805 cf Average Runoff Depth = 5.56" 9.82% Pervious = 2,289 sf 90.18% Impervious = 21,025 sf	

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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment A1: Subcatchment A1

Runoff = 0.82 cfs @ 12.08 hrs, Volume= 2,931 cf, Depth= 6.16"

Routed to Link A : Ex Drainage System Rindge Ave

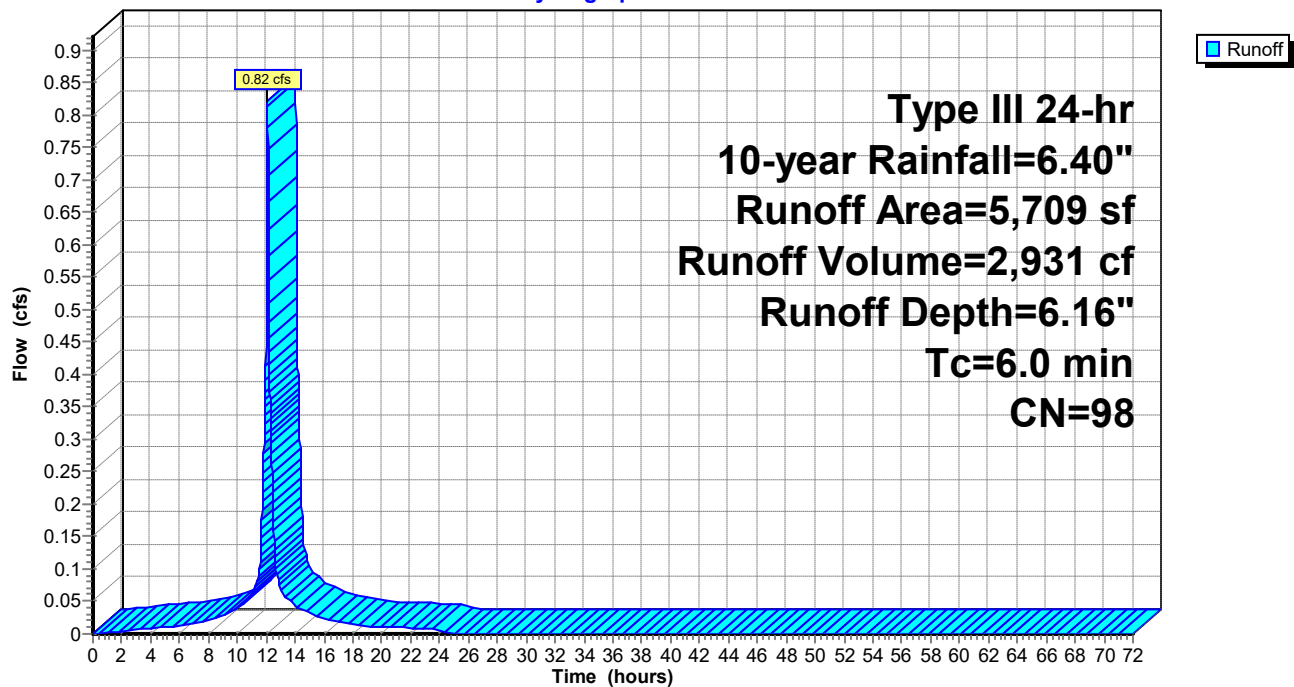
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

	Area (sf)	CN	Description
*	5,709	98	Roofs and Paved parkings
	5,709		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1: Subcatchment A1

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment A2: Subcatchment A2

Runoff = 1.67 cfs @ 12.08 hrs, Volume= 5,718 cf, Depth= 5.81"

Routed to Link A : Ex Drainage System Rindge Ave

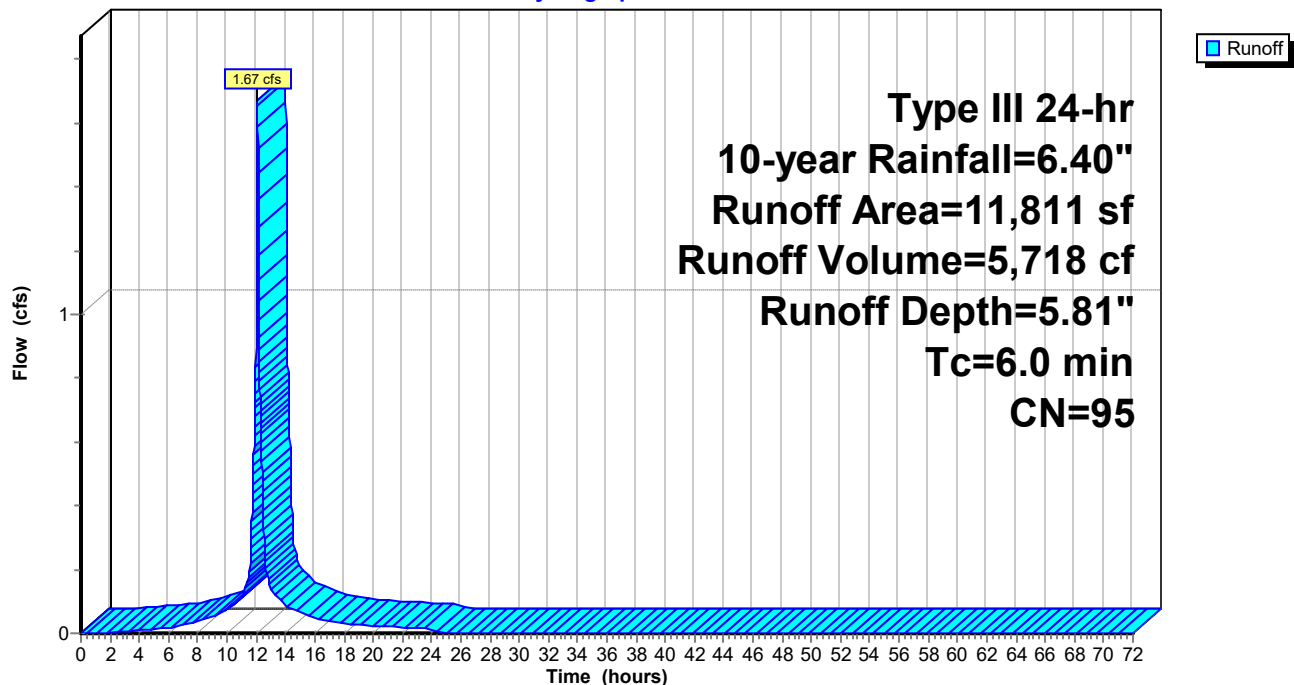
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

	Area (sf)	CN	Description
*	11,187	98	Roofs and Paved parkings
	624	39	>75% Grass cover, Good, HSG A
	11,811	95	Weighted Average
	624		5.28% Pervious Area
	11,187		94.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment A3: Subcatchment A3

Runoff = 0.01 cfs @ 12.30 hrs, Volume= 55 cf, Depth= 0.57"

Routed to Link A : Ex Drainage System Rindge Ave

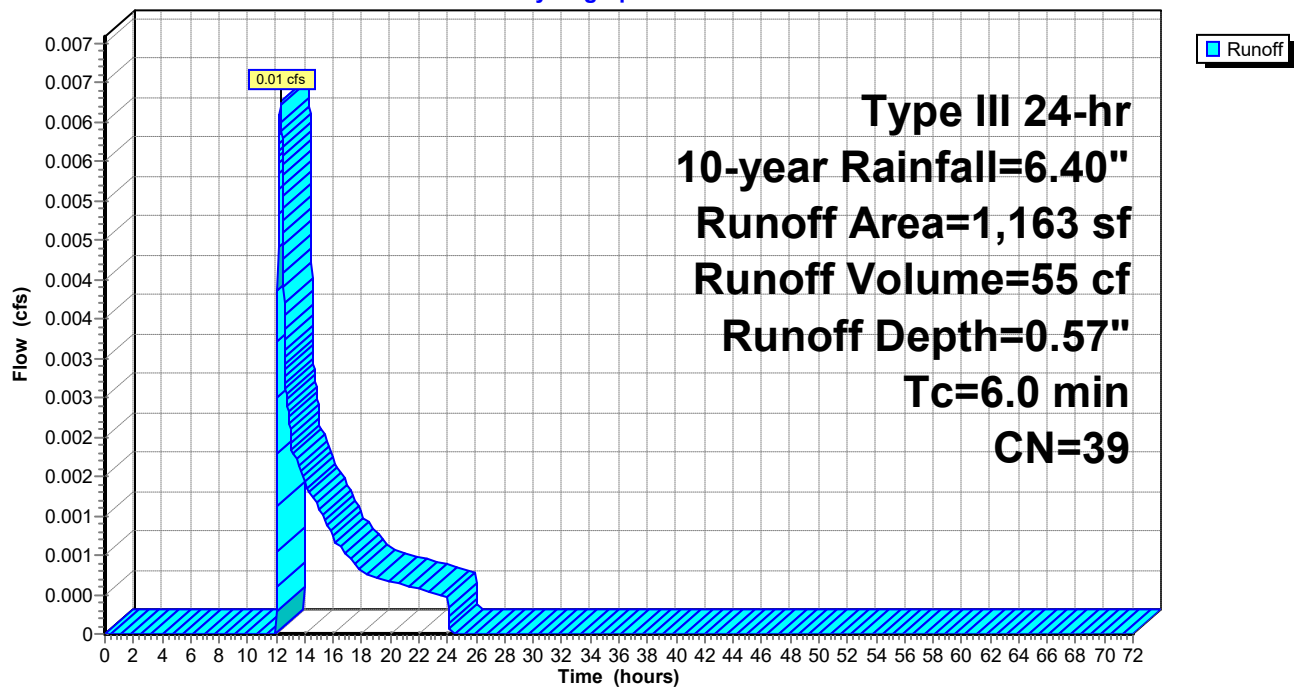
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3: Subcatchment A3

Hydrograph



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Summary for Subcatchment B1: Subcatchment B1

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 966 cf, Depth= 4.79"
Routed to Link B : Off-Site Runoff

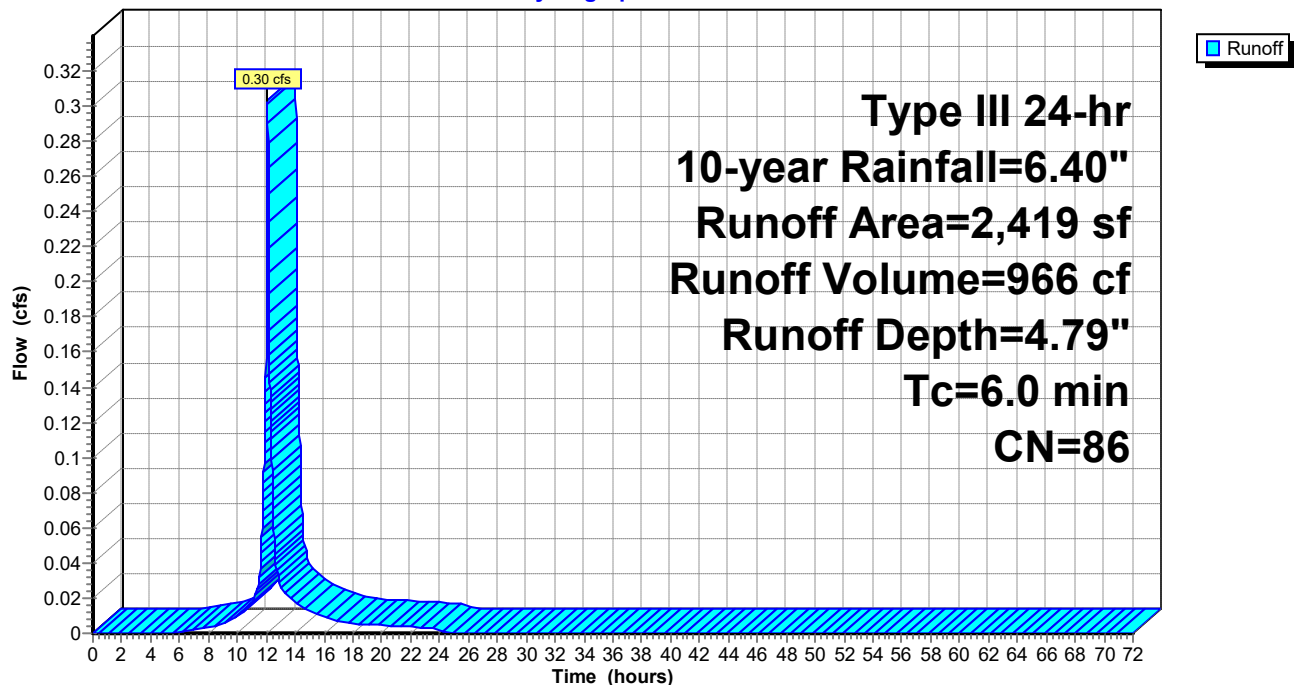
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

	Area (sf)	CN	Description
*	1,917	98	Roofs & Paved parkings
	502	39	>75% Grass cover, Good, HSG A
	2,419	86	Weighted Average
	502		20.75% Pervious Area
	1,917		79.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment B1: Subcatchment B1

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment C1: Subcatchment C1

Runoff = 0.32 cfs @ 12.08 hrs, Volume= 1,136 cf, Depth= 6.16"
Routed to Link C : Off-Site East Side

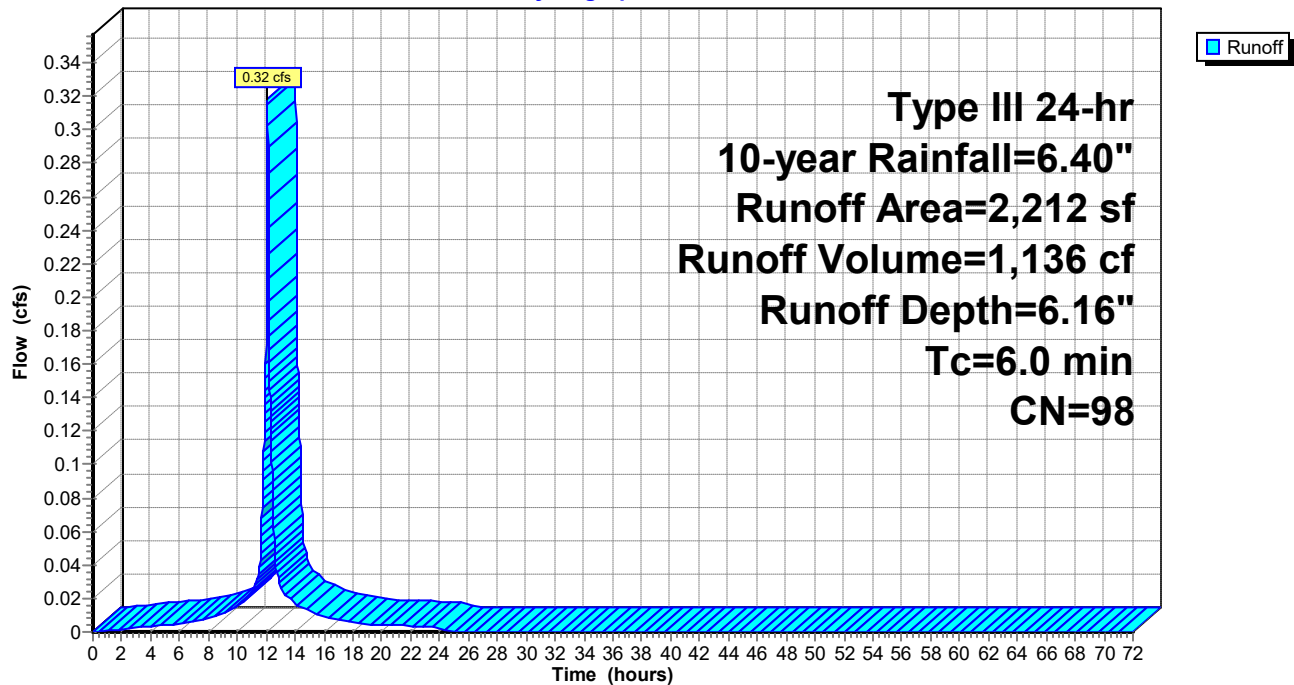
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

	Area (sf)	CN	Description
*	2,212	98	Roofs and Paved parking
	2,212		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment C1: Subcatchment C1

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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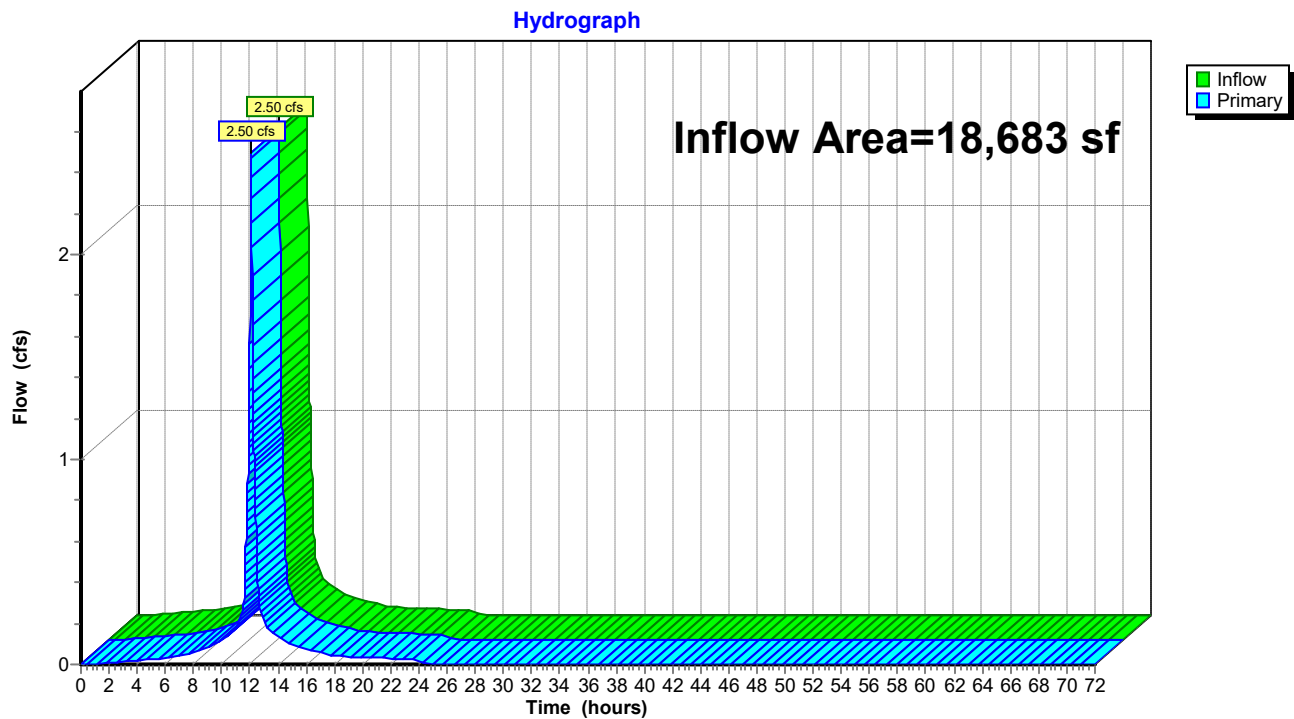
Page 21

Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 18,683 sf, 90.44% Impervious, Inflow Depth = 5.59" for 10-year event
Inflow = 2.50 cfs @ 12.08 hrs, Volume= 8,704 cf
Primary = 2.50 cfs @ 12.08 hrs, Volume= 8,704 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave



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Type III 24-hr 10-year Rainfall=6.40"

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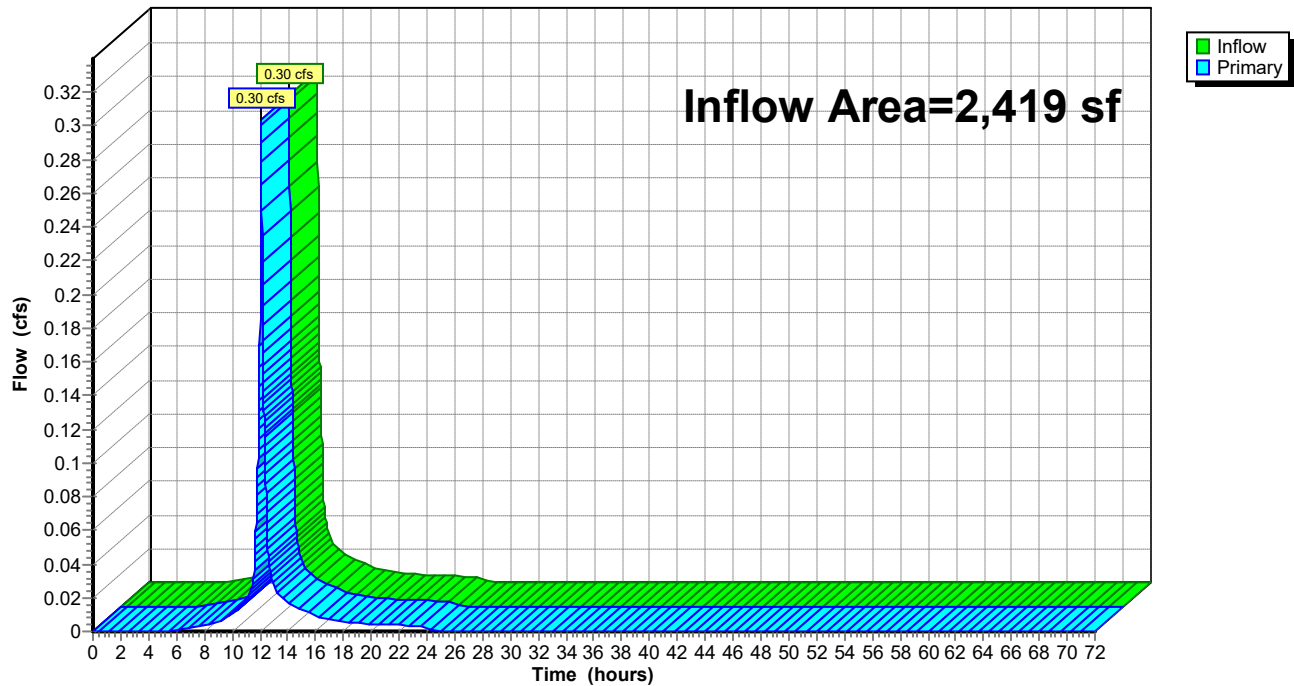
Summary for Link B: Off-Site Runoff

Inflow Area = 2,419 sf, 79.25% Impervious, Inflow Depth = 4.79" for 10-year event
Inflow = 0.30 cfs @ 12.09 hrs, Volume= 966 cf
Primary = 0.30 cfs @ 12.09 hrs, Volume= 966 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: Off-Site Runoff

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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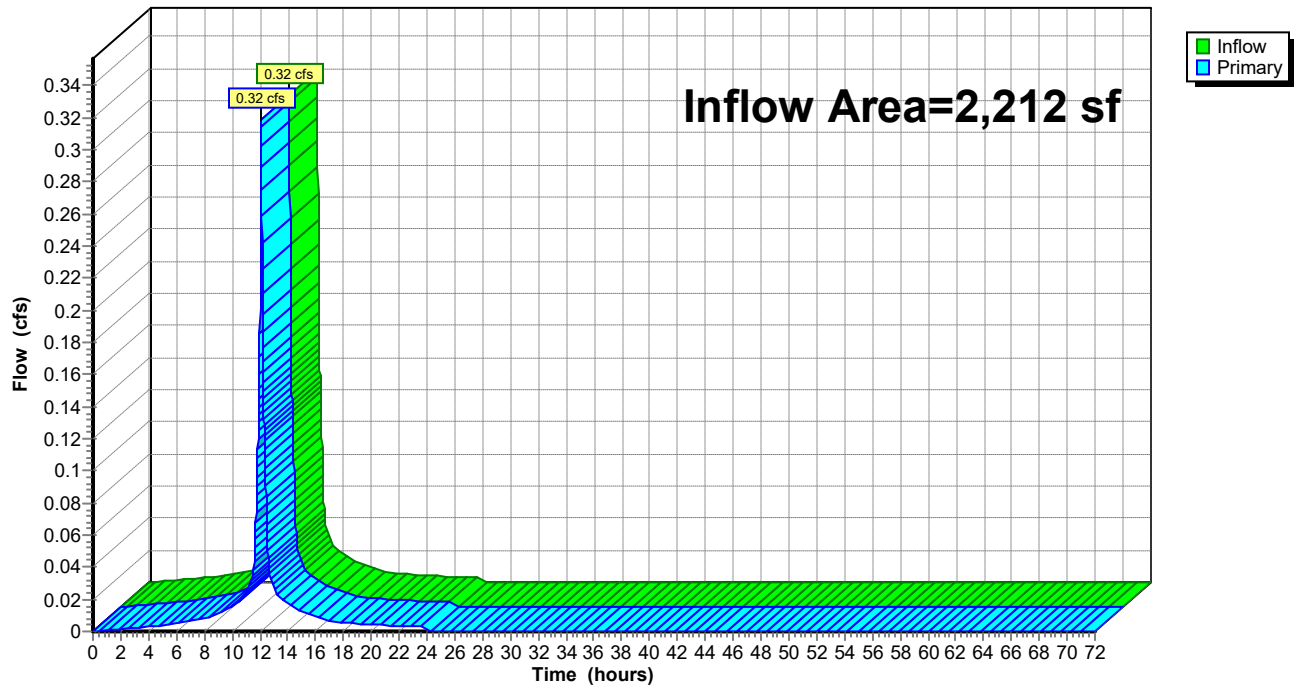
Summary for Link C: Off-Site East Side

Inflow Area = 2,212 sf, 100.00% Impervious, Inflow Depth = 6.16" for 10-year event
Inflow = 0.32 cfs @ 12.08 hrs, Volume= 1,136 cf
Primary = 0.32 cfs @ 12.08 hrs, Volume= 1,136 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link C: Off-Site East Side

Hydrograph



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Type III 24-hr 25-year Rainfall=8.22"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Subcatchment A1	Runoff Area=5,709 sf 100.00% Impervious Runoff Depth=7.98" Tc=6.0 min CN=98 Runoff=1.06 cfs 3,797 cf
Subcatchment A2: Subcatchment A2	Runoff Area=11,811 sf 94.72% Impervious Runoff Depth=7.62" Tc=6.0 min CN=95 Runoff=2.16 cfs 7,500 cf
Subcatchment A3: Subcatchment A3	Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=1.25" Tc=6.0 min CN=39 Runoff=0.03 cfs 121 cf
Subcatchment B1: Subcatchment B1	Runoff Area=2,419 sf 79.25% Impervious Runoff Depth=6.54" Tc=6.0 min CN=86 Runoff=0.41 cfs 1,319 cf
Subcatchment C1: Subcatchment C1	Runoff Area=2,212 sf 100.00% Impervious Runoff Depth=7.98" Tc=6.0 min CN=98 Runoff=0.41 cfs 1,471 cf
Link A: Ex Drainage System Rindge Ave	Inflow=3.25 cfs 11,418 cf Primary=3.25 cfs 11,418 cf
Link B: Off-Site Runoff	Inflow=0.41 cfs 1,319 cf Primary=0.41 cfs 1,319 cf
Link C: Off-Site East Side	Inflow=0.41 cfs 1,471 cf Primary=0.41 cfs 1,471 cf
Total Runoff Area = 23,314 sf Runoff Volume = 14,208 cf Average Runoff Depth = 7.31" 9.82% Pervious = 2,289 sf 90.18% Impervious = 21,025 sf	

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Type III 24-hr 25-year Rainfall=8.22"

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Summary for Subcatchment A1: Subcatchment A1

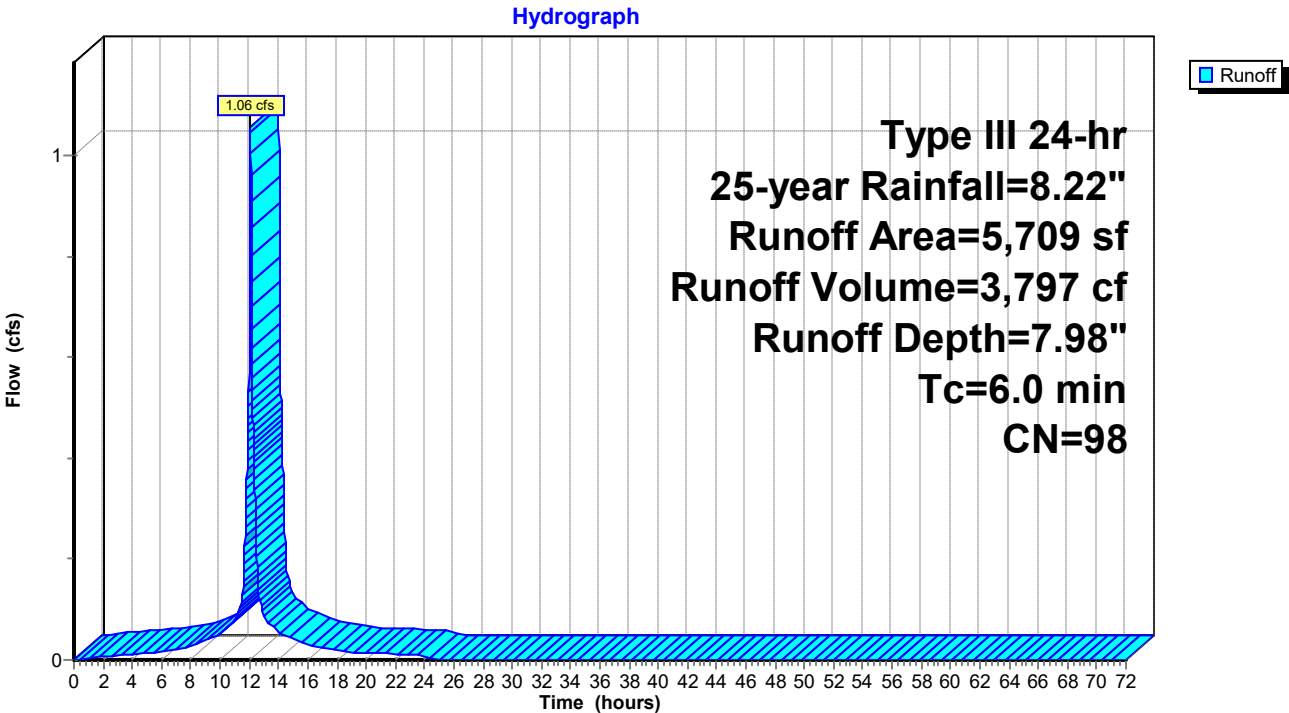
Runoff = 1.06 cfs @ 12.08 hrs, Volume= 3,797 cf, Depth= 7.98"
Routed to Link A : Ex Drainage System Rindge Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

	Area (sf)	CN	Description
*	5,709	98	Roofs and Paved parkings
	5,709		100.00% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, tc

Subcatchment A1: Subcatchment A1



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Type III 24-hr 25-year Rainfall=8.22"

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Summary for Subcatchment A2: Subcatchment A2

Runoff = 2.16 cfs @ 12.08 hrs, Volume= 7,500 cf, Depth= 7.62"
Routed to Link A : Ex Drainage System Rindge Ave

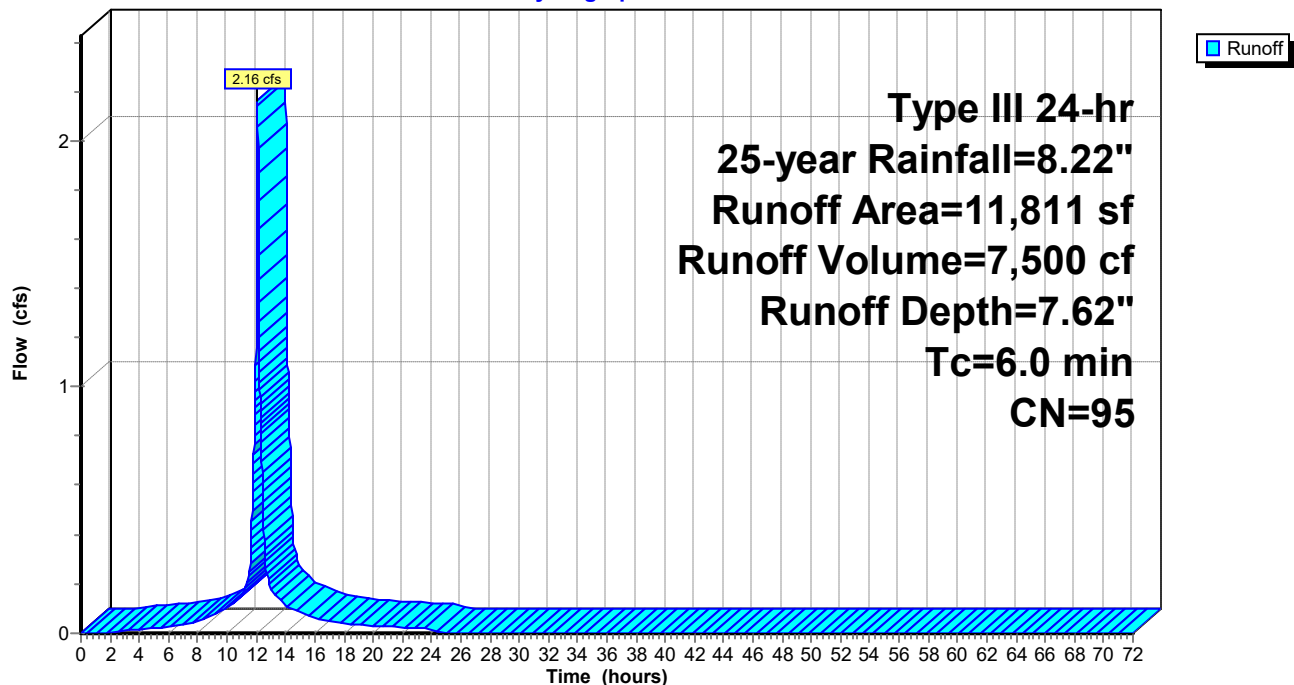
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

	Area (sf)	CN	Description
*	11,187	98	Roofs and Paved parkings
	624	39	>75% Grass cover, Good, HSG A
	11,811	95	Weighted Average
	624		5.28% Pervious Area
	11,187		94.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Summary for Subcatchment A3: Subcatchment A3

Runoff = 0.03 cfs @ 12.12 hrs, Volume= 121 cf, Depth= 1.25"
Routed to Link A : Ex Drainage System Rindge Ave

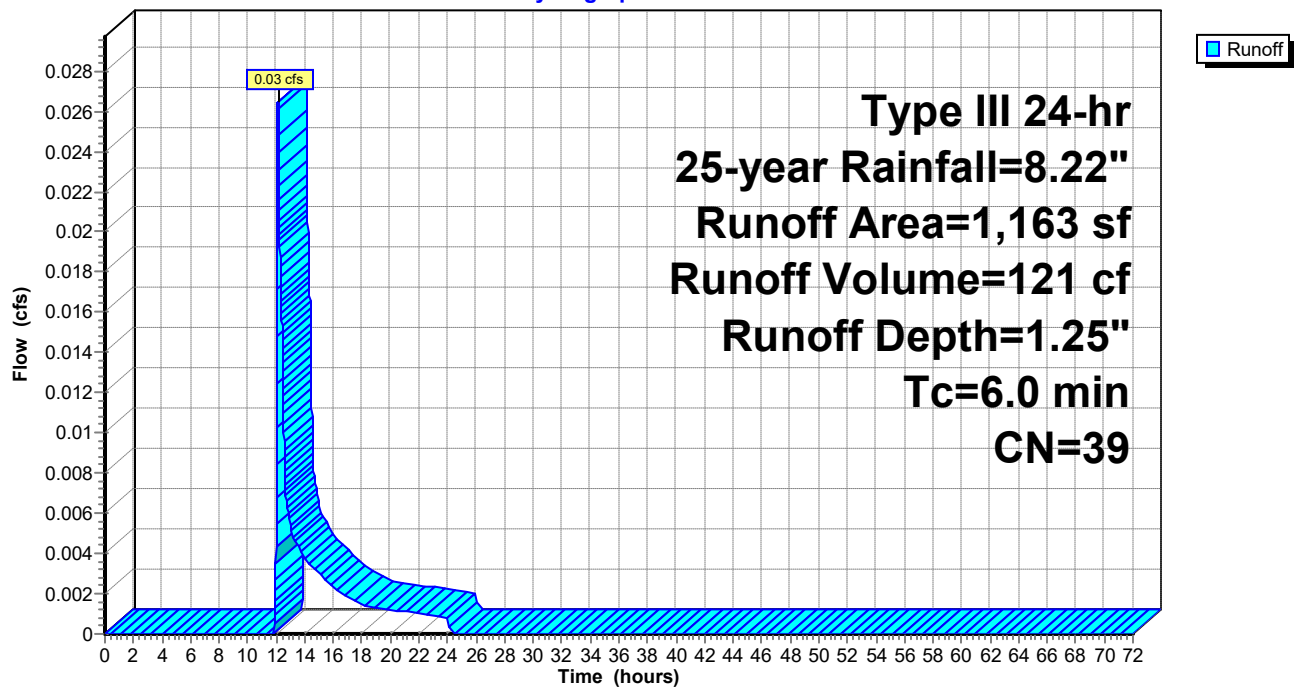
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3: Subcatchment A3

Hydrograph



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Type III 24-hr 25-year Rainfall=8.22"

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Summary for Subcatchment B1: Subcatchment B1

Runoff = 0.41 cfs @ 12.08 hrs, Volume= 1,319 cf, Depth= 6.54"
Routed to Link B : Off-Site Runoff

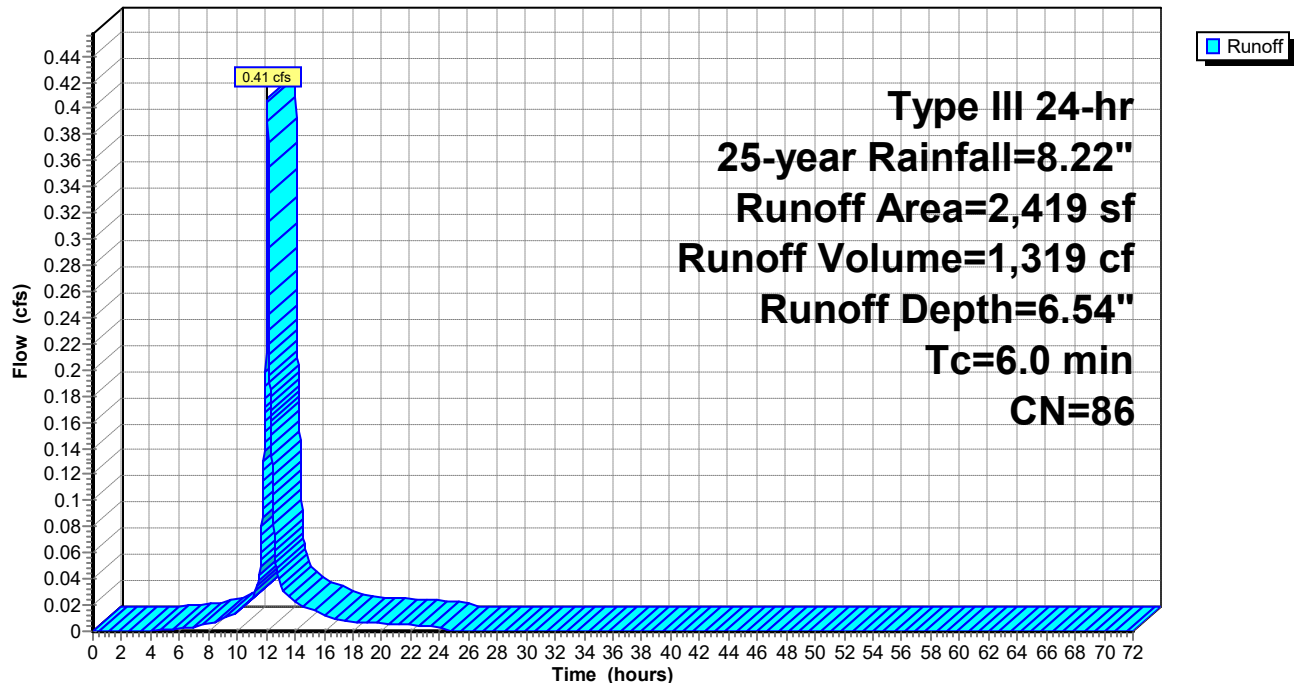
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

	Area (sf)	CN	Description
*	1,917	98	Roofs & Paved parkings
	502	39	>75% Grass cover, Good, HSG A
	2,419	86	Weighted Average
	502		20.75% Pervious Area
	1,917		79.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment B1: Subcatchment B1

Hydrograph



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Type III 24-hr 25-year Rainfall=8.22"

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Summary for Subcatchment C1: Subcatchment C1

Runoff = 0.41 cfs @ 12.08 hrs, Volume= 1,471 cf, Depth= 7.98"
Routed to Link C : Off-Site East Side

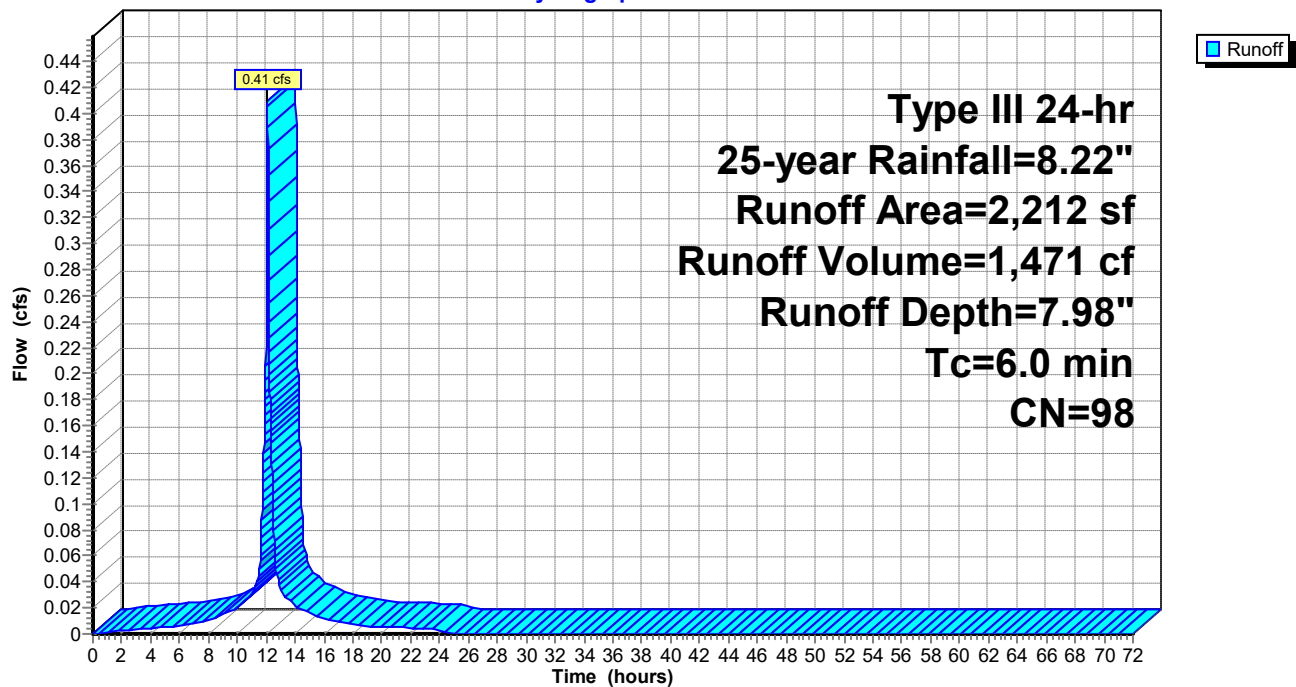
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

	Area (sf)	CN	Description
*	2,212	98	Roofs and Paved parking
	2,212		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment C1: Subcatchment C1

Hydrograph



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Type III 24-hr 25-year Rainfall=8.22"

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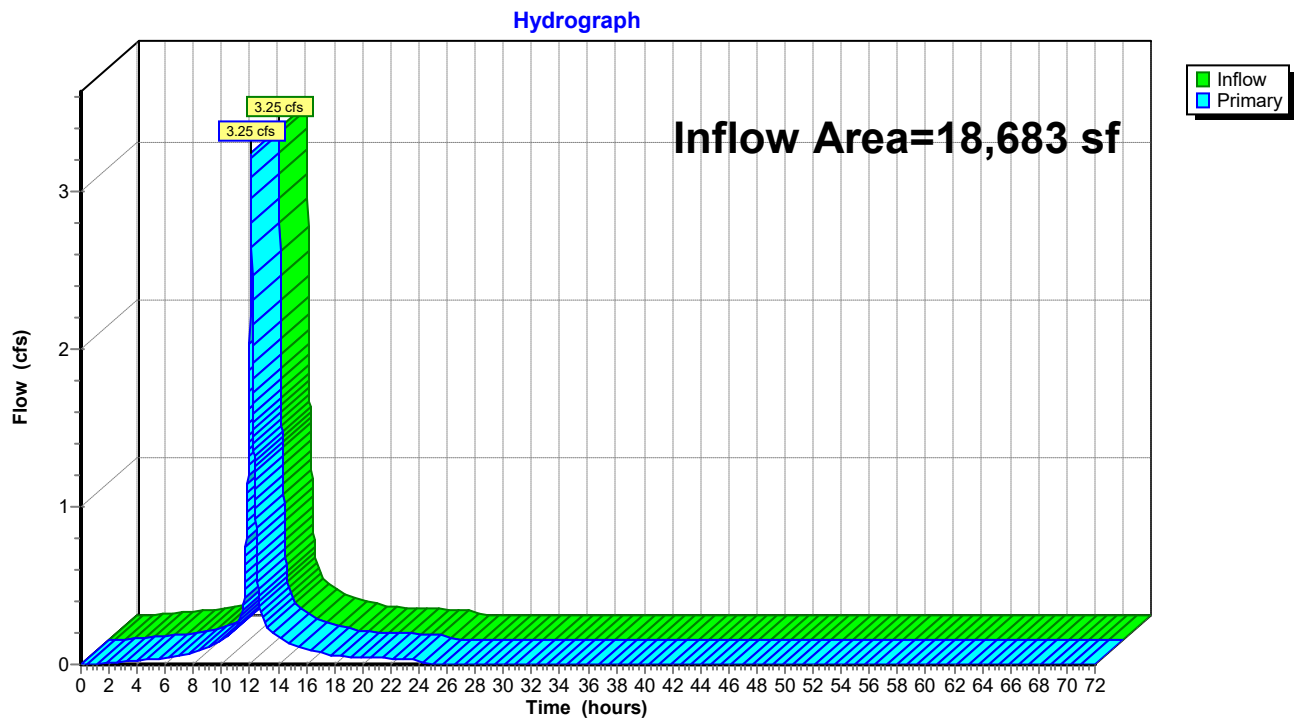
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Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 18,683 sf, 90.44% Impervious, Inflow Depth = 7.33" for 25-year event
Inflow = 3.25 cfs @ 12.08 hrs, Volume= 11,418 cf
Primary = 3.25 cfs @ 12.08 hrs, Volume= 11,418 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave



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Type III 24-hr 25-year Rainfall=8.22"

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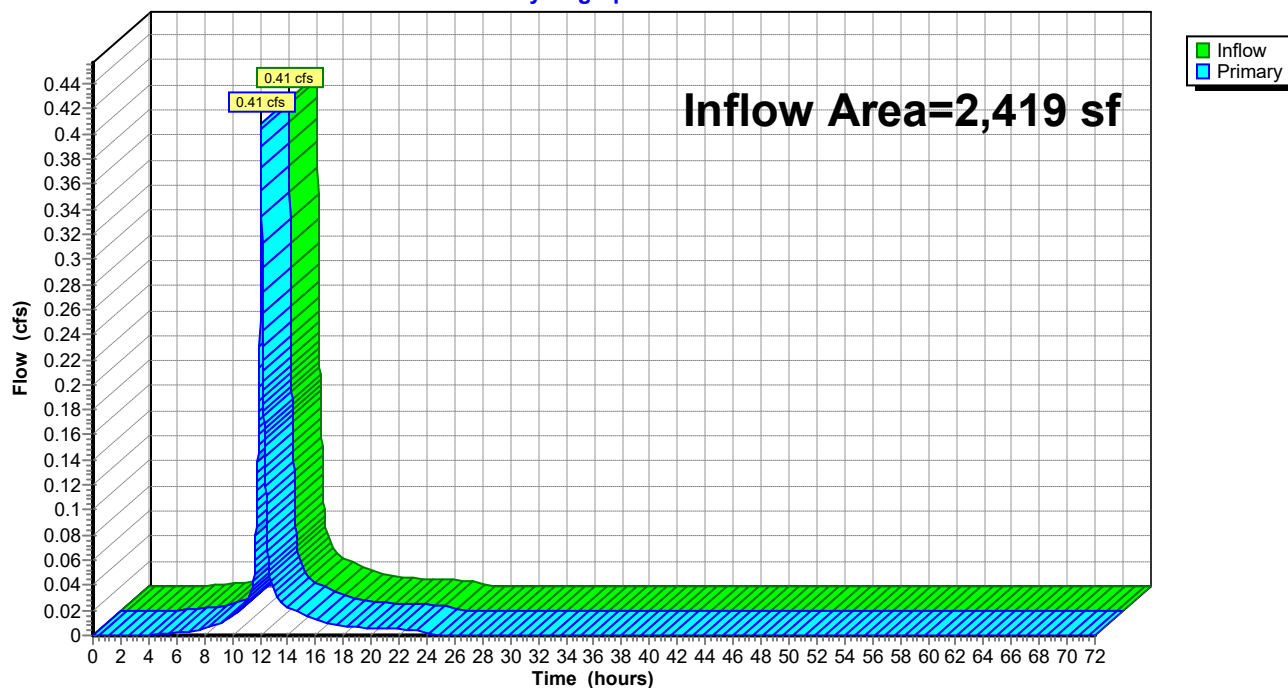
Summary for Link B: Off-Site Runoff

Inflow Area = 2,419 sf, 79.25% Impervious, Inflow Depth = 6.54" for 25-year event
Inflow = 0.41 cfs @ 12.08 hrs, Volume= 1,319 cf
Primary = 0.41 cfs @ 12.08 hrs, Volume= 1,319 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: Off-Site Runoff

Hydrograph



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Type III 24-hr 25-year Rainfall=8.22"

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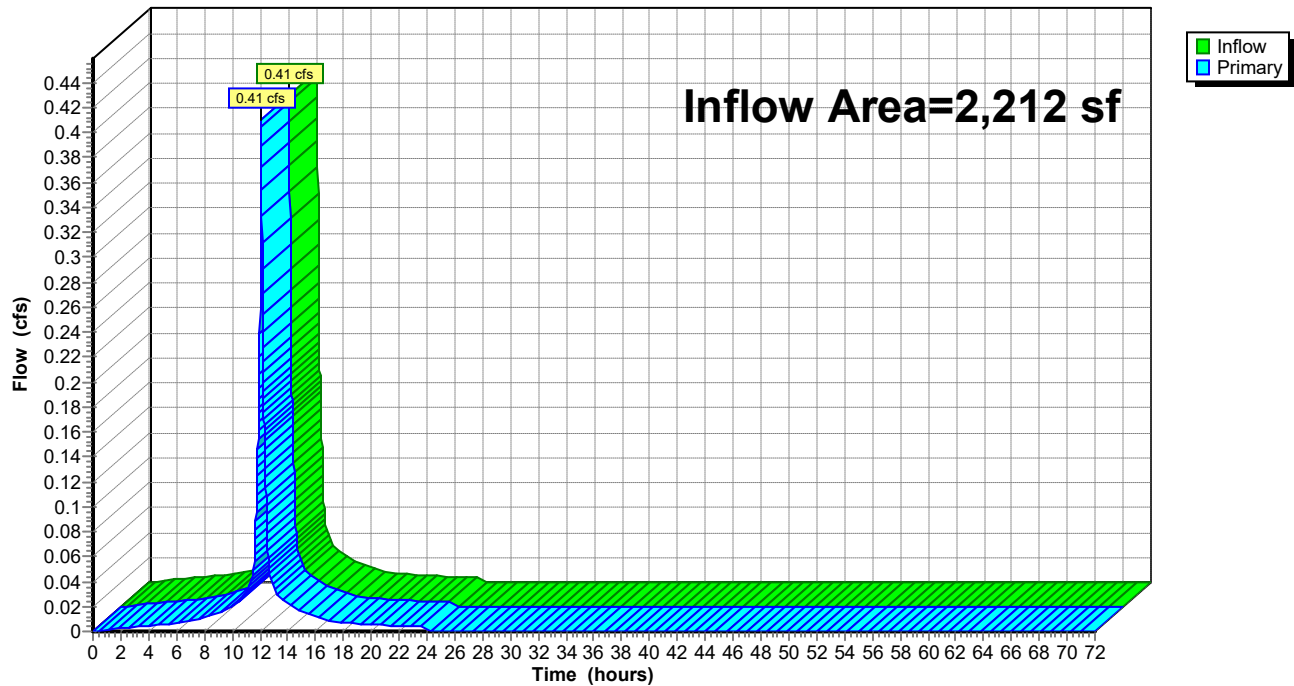
Summary for Link C: Off-Site East Side

Inflow Area = 2,212 sf, 100.00% Impervious, Inflow Depth = 7.98" for 25-year event
Inflow = 0.41 cfs @ 12.08 hrs, Volume= 1,471 cf
Primary = 0.41 cfs @ 12.08 hrs, Volume= 1,471 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link C: Off-Site East Side

Hydrograph



EX-HYDRO*Type III 24-hr 100-year Rainfall=11.70"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Subcatchment A1	Runoff Area=5,709 sf 100.00% Impervious Runoff Depth=11.46" Tc=6.0 min CN=98 Runoff=1.51 cfs 5,451 cf
Subcatchment A2: Subcatchment A2	Runoff Area=11,811 sf 94.72% Impervious Runoff Depth=11.09" Tc=6.0 min CN=95 Runoff=3.10 cfs 10,917 cf
Subcatchment A3: Subcatchment A3	Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=3.03" Tc=6.0 min CN=39 Runoff=0.09 cfs 294 cf
Subcatchment B1: Subcatchment B1	Runoff Area=2,419 sf 79.25% Impervious Runoff Depth=9.95" Tc=6.0 min CN=86 Runoff=0.61 cfs 2,006 cf
Subcatchment C1: Subcatchment C1	Runoff Area=2,212 sf 100.00% Impervious Runoff Depth=11.46" Tc=6.0 min CN=98 Runoff=0.58 cfs 2,112 cf
Link A: Ex Drainage System Rindge Ave	Inflow=4.69 cfs 16,662 cf Primary=4.69 cfs 16,662 cf
Link B: Off-Site Runoff	Inflow=0.61 cfs 2,006 cf Primary=0.61 cfs 2,006 cf
Link C: Off-Site East Side	Inflow=0.58 cfs 2,112 cf Primary=0.58 cfs 2,112 cf
Total Runoff Area = 23,314 sf Runoff Volume = 20,780 cf Average Runoff Depth = 10.70" 9.82% Pervious = 2,289 sf 90.18% Impervious = 21,025 sf	

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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A1: Subcatchment A1

Runoff = 1.51 cfs @ 12.08 hrs, Volume= 5,451 cf, Depth=11.46"

Routed to Link A : Ex Drainage System Rindge Ave

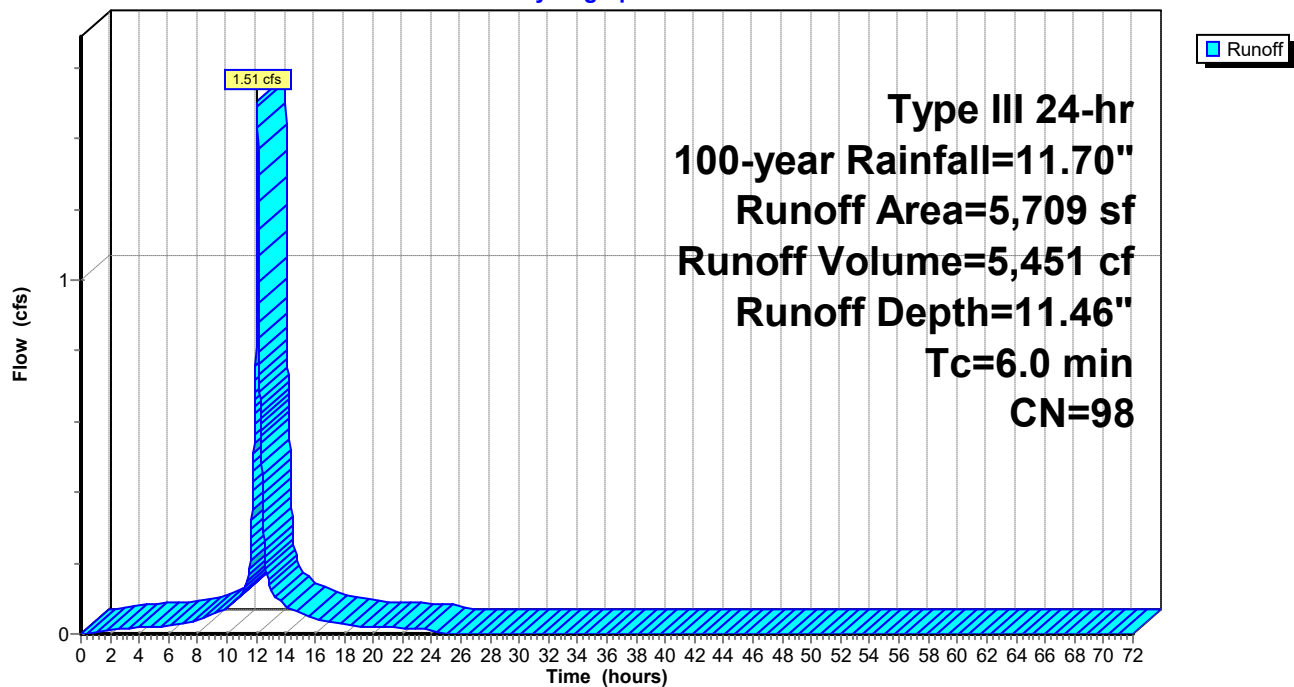
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

	Area (sf)	CN	Description
*	5,709	98	Roofs and Paved parkings
	5,709		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1: Subcatchment A1

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A2: Subcatchment A2

Runoff = 3.10 cfs @ 12.08 hrs, Volume= 10,917 cf, Depth=11.09"

Routed to Link A : Ex Drainage System Rindge Ave

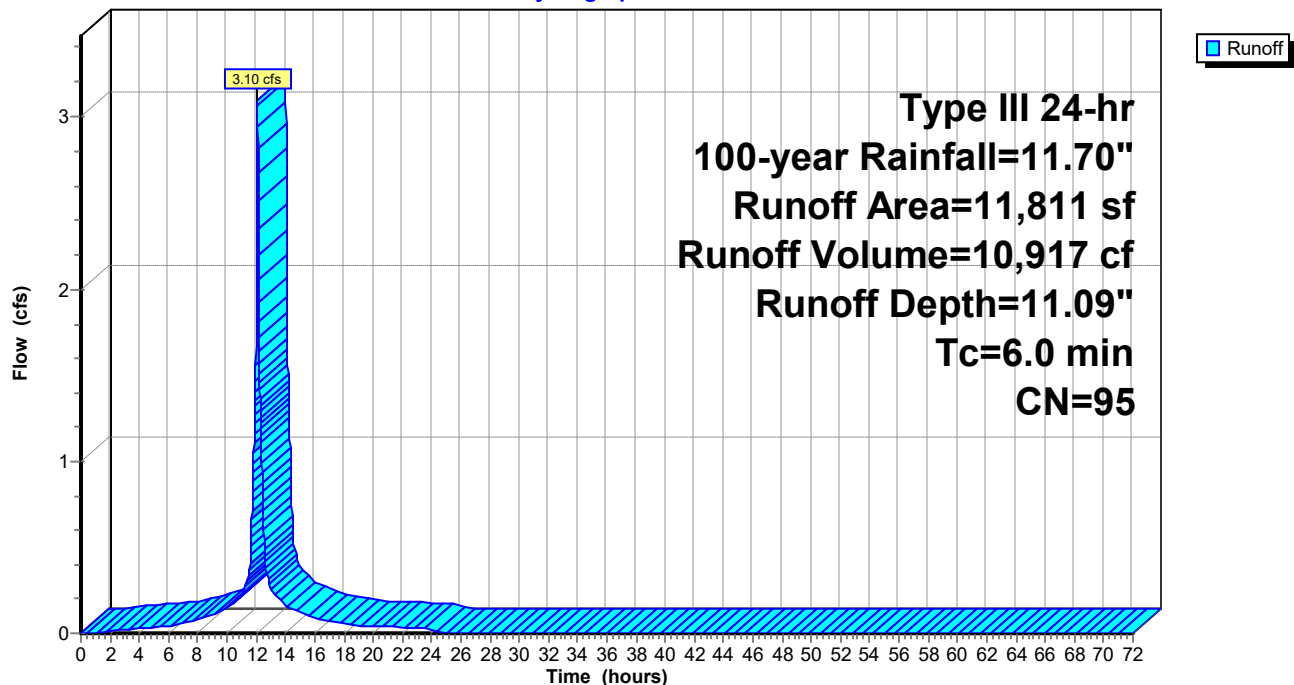
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

	Area (sf)	CN	Description
*	11,187	98	Roofs and Paved parkings
	624	39	>75% Grass cover, Good, HSG A
	11,811	95	Weighted Average
	624		5.28% Pervious Area
	11,187		94.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A3: Subcatchment A3

Runoff = 0.09 cfs @ 12.10 hrs, Volume= 294 cf, Depth= 3.03"

Routed to Link A : Ex Drainage System Rindge Ave

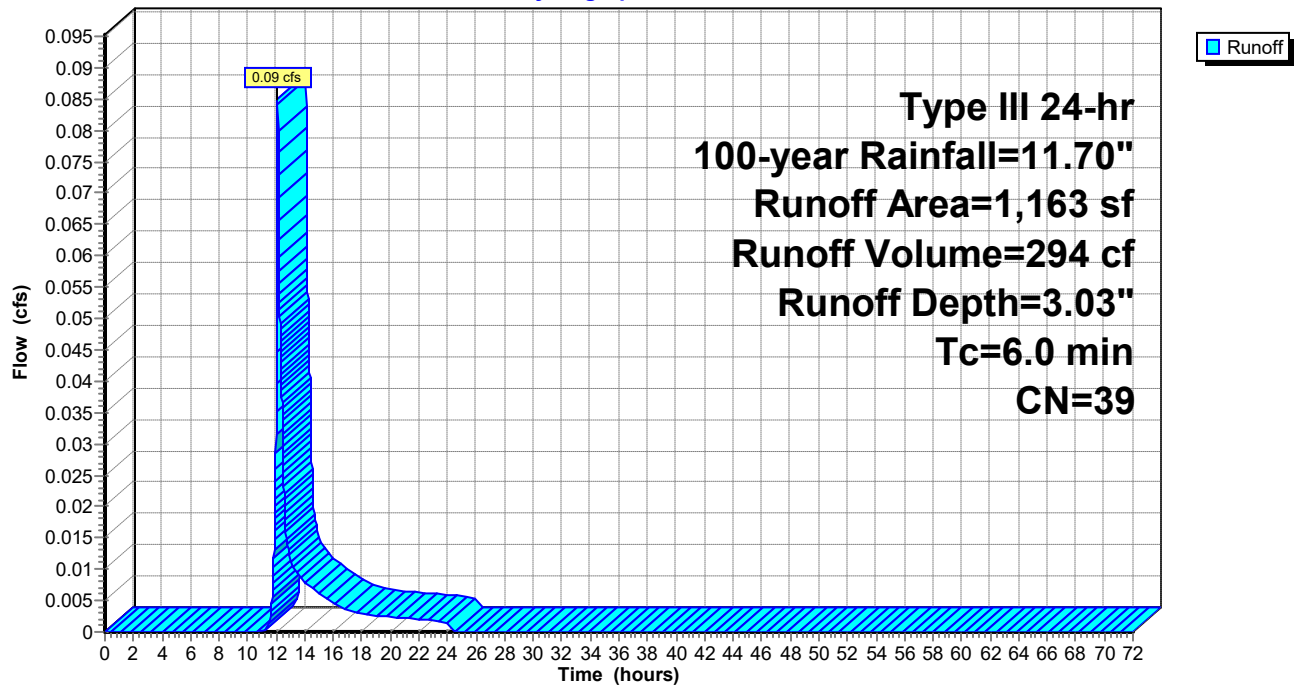
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3: Subcatchment A3

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment B1: Subcatchment B1

Runoff = 0.61 cfs @ 12.08 hrs, Volume= 2,006 cf, Depth= 9.95"
Routed to Link B : Off-Site Runoff

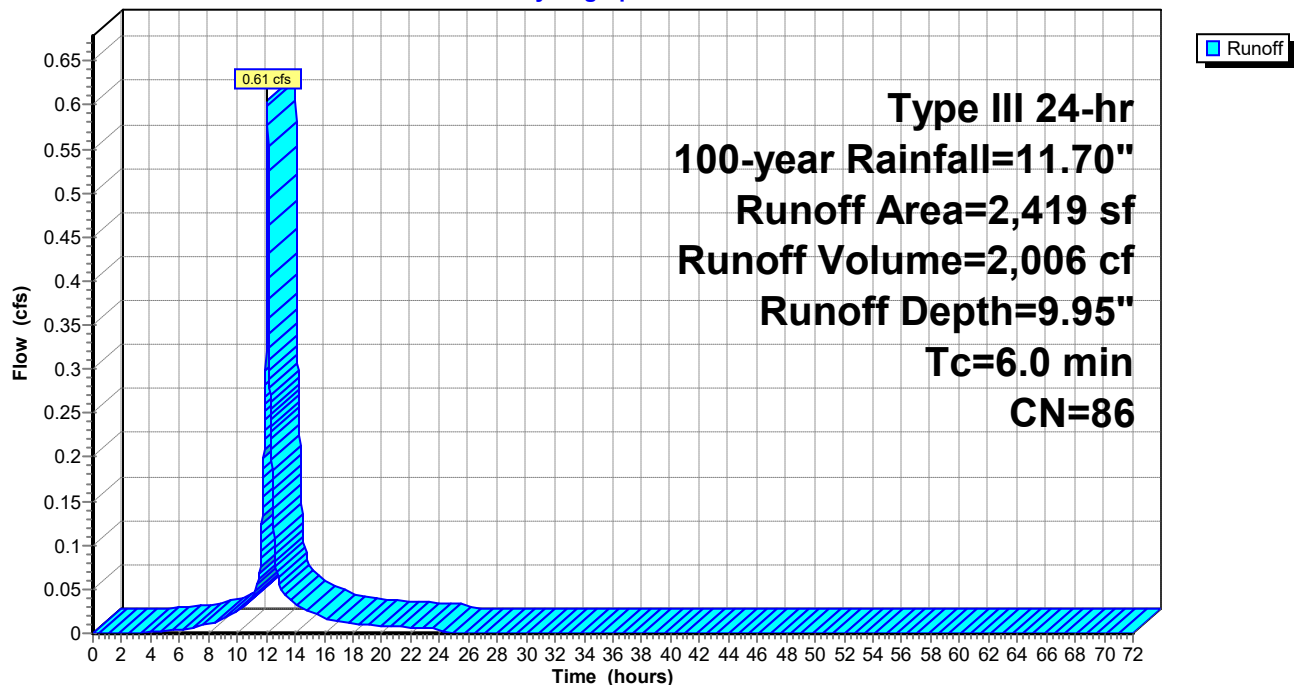
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

	Area (sf)	CN	Description
*	1,917	98	Roofs & Paved parkings
	502	39	>75% Grass cover, Good, HSG A
	2,419	86	Weighted Average
	502		20.75% Pervious Area
	1,917		79.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment B1: Subcatchment B1

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment C1: Subcatchment C1

Runoff = 0.58 cfs @ 12.08 hrs, Volume= 2,112 cf, Depth=11.46"
Routed to Link C : Off-Site East Side

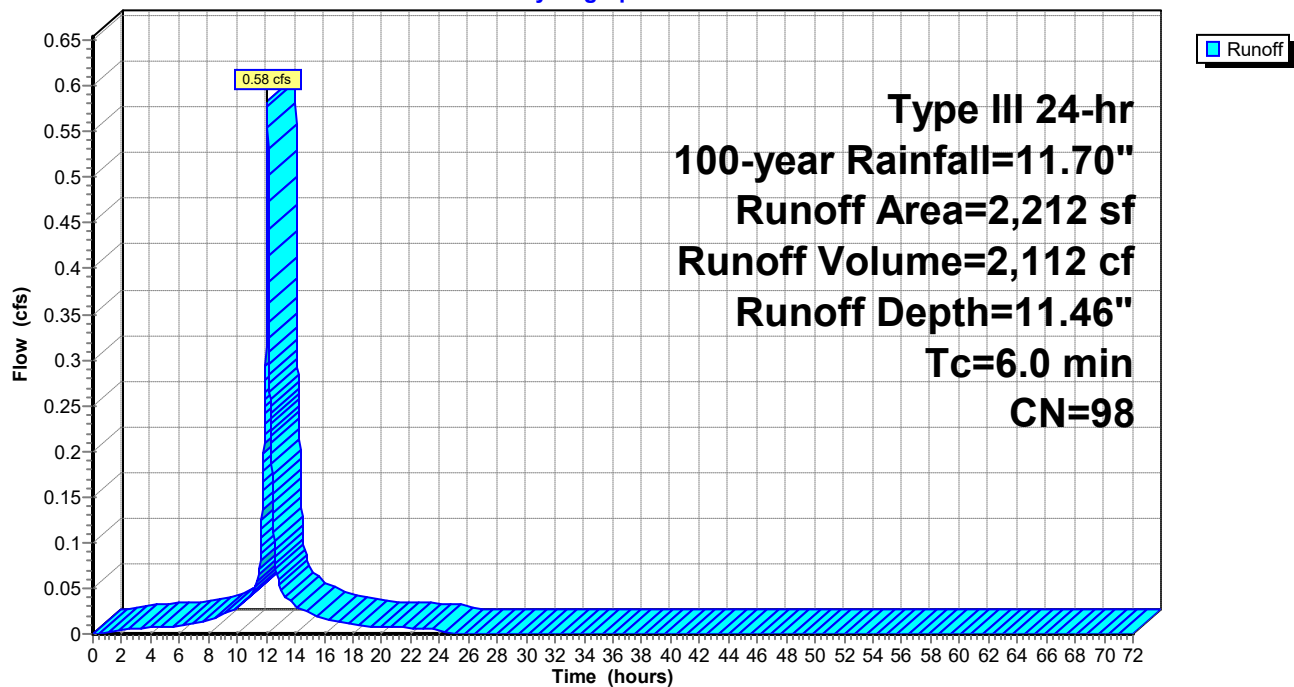
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

	Area (sf)	CN	Description
*	2,212	98	Roofs and Paved parking
	2,212		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment C1: Subcatchment C1

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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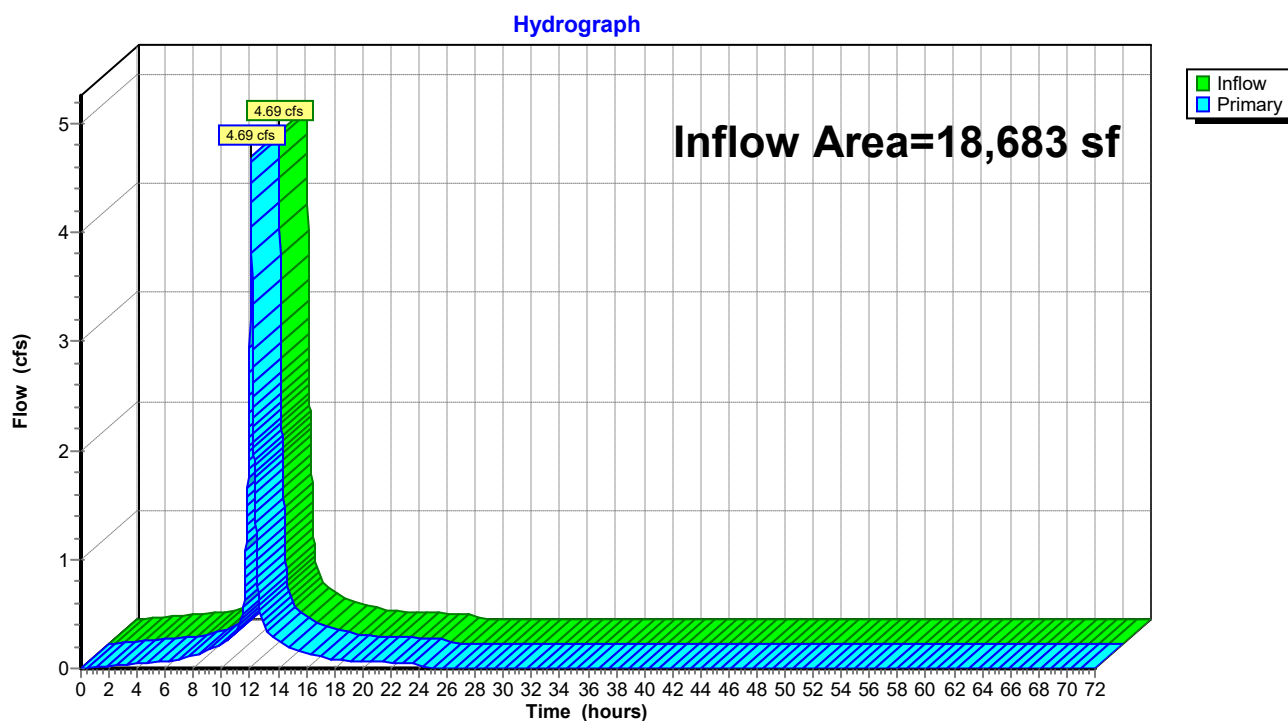
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Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 18,683 sf, 90.44% Impervious, Inflow Depth = 10.70" for 100-year event
Inflow = 4.69 cfs @ 12.08 hrs, Volume= 16,662 cf
Primary = 4.69 cfs @ 12.08 hrs, Volume= 16,662 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave



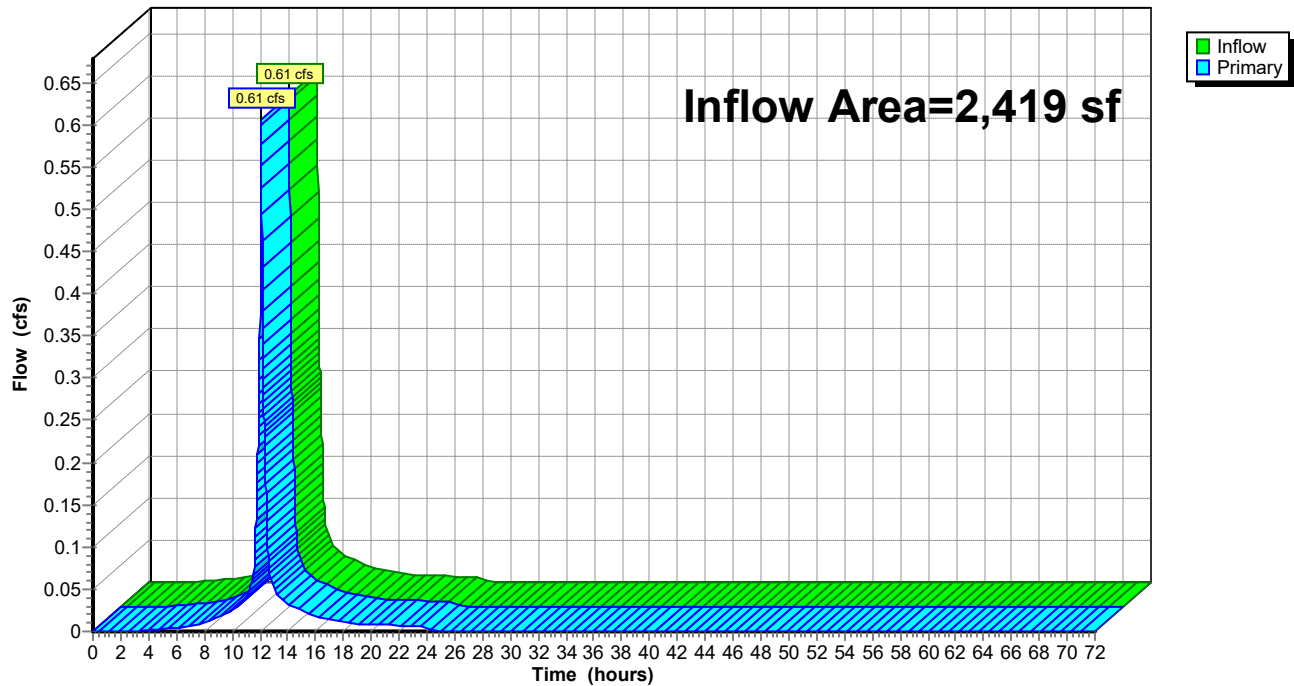
Summary for Link B: Off-Site Runoff

Inflow Area = 2,419 sf, 79.25% Impervious, Inflow Depth = 9.95" for 100-year event
Inflow = 0.61 cfs @ 12.08 hrs, Volume= 2,006 cf
Primary = 0.61 cfs @ 12.08 hrs, Volume= 2,006 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: Off-Site Runoff

Hydrograph



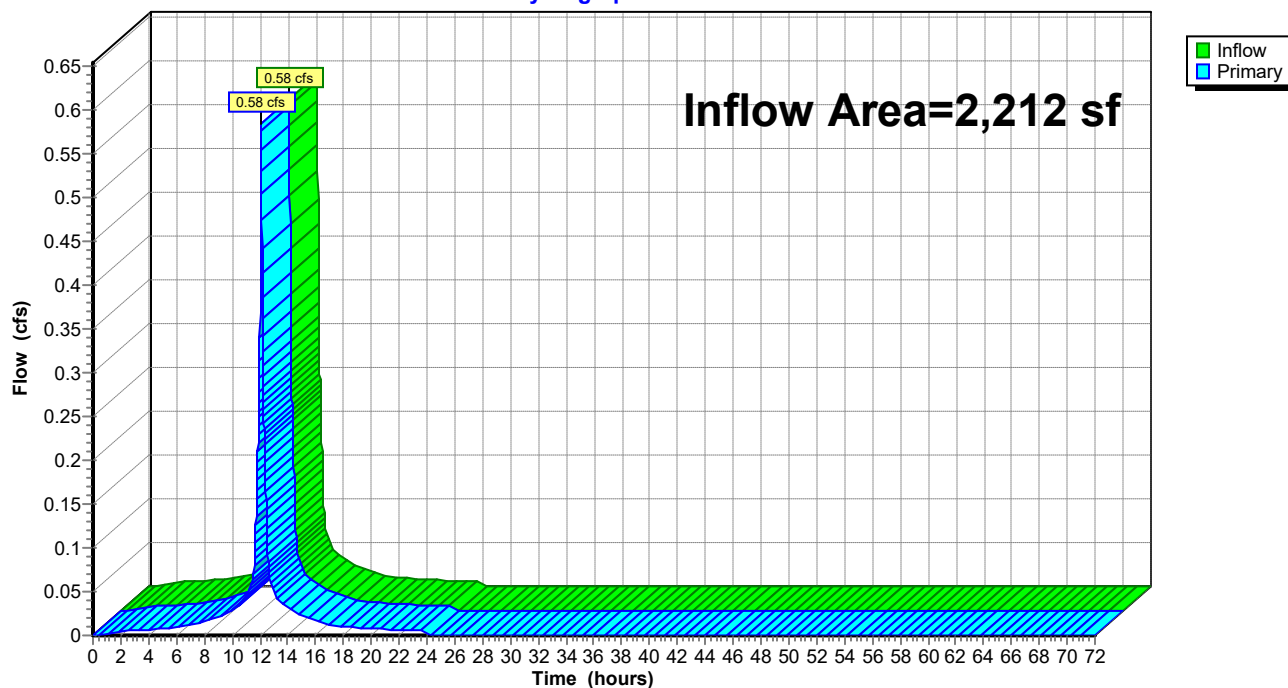
Summary for Link C: Off-Site East Side

Inflow Area = 2,212 sf, 100.00% Impervious, Inflow Depth = 11.46" for 100-year event
Inflow = 0.58 cfs @ 12.08 hrs, Volume= 2,112 cf
Primary = 0.58 cfs @ 12.08 hrs, Volume= 2,112 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link C: Off-Site East Side

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: Subcatchment A1	Runoff Area=5,709 sf 100.00% Impervious Runoff Depth=0.99" Tc=6.0 min CN=98 Runoff=0.14 cfs 469 cf
Subcatchment A2: Subcatchment A2	Runoff Area=11,811 sf 94.72% Impervious Runoff Depth=0.74" Tc=6.0 min CN=95 Runoff=0.23 cfs 728 cf
Subcatchment A3: Subcatchment A3	Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf
Subcatchment B1: Subcatchment B1	Runoff Area=2,419 sf 79.25% Impervious Runoff Depth=0.31" Tc=6.0 min CN=86 Runoff=0.02 cfs 62 cf
Subcatchment C1: Subcatchment C1	Runoff Area=2,212 sf 100.00% Impervious Runoff Depth=0.99" Tc=6.0 min CN=98 Runoff=0.06 cfs 182 cf
Link A: Ex Drainage System Rindge Ave	Inflow=0.38 cfs 1,197 cf Primary=0.38 cfs 1,197 cf
Link B: Off-Site Runoff	Inflow=0.02 cfs 62 cf Primary=0.02 cfs 62 cf
Link C: Off-Site East Side	Inflow=0.06 cfs 182 cf Primary=0.06 cfs 182 cf
Total Runoff Area = 23,314 sf Runoff Volume = 1,440 cf Average Runoff Depth = 0.74" 9.82% Pervious = 2,289 sf 90.18% Impervious = 21,025 sf	

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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A1: Subcatchment A1

Runoff = 0.14 cfs @ 12.08 hrs, Volume= 469 cf, Depth= 0.99"

Routed to Link A : Ex Drainage System Rindge Ave

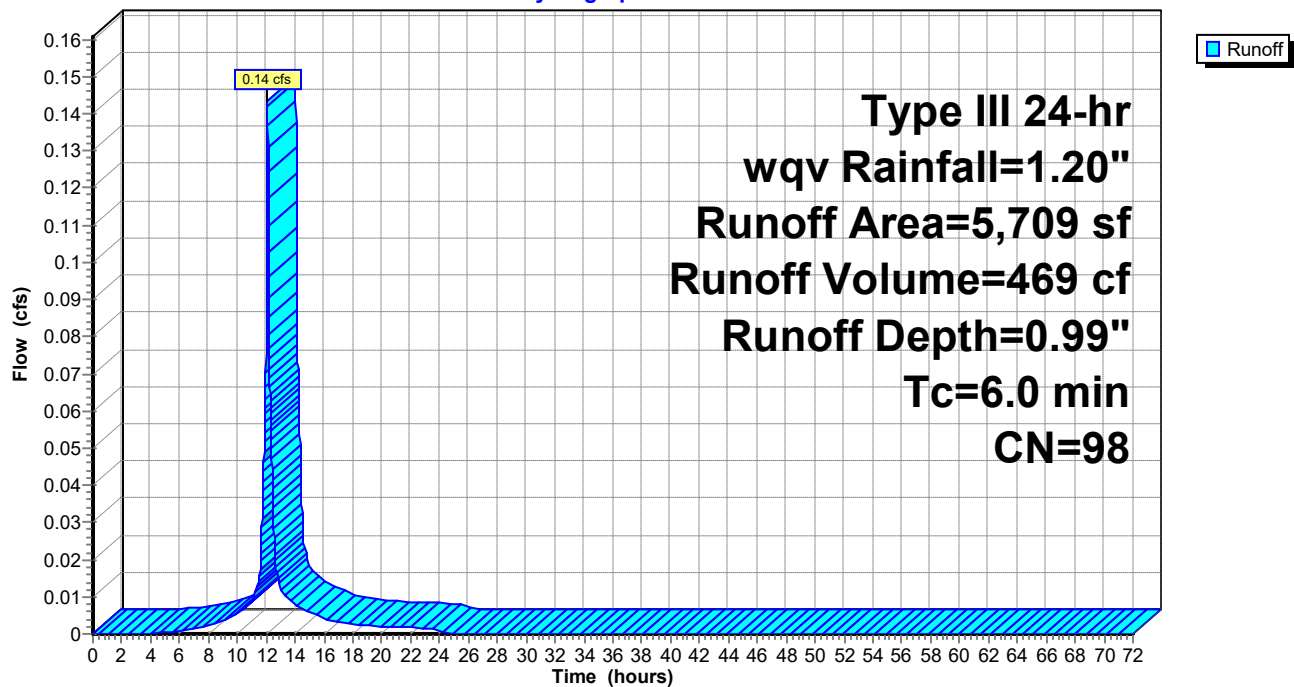
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

	Area (sf)	CN	Description
*	5,709	98	Roofs and Paved parkings
	5,709		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1: Subcatchment A1

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A2: Subcatchment A2

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 728 cf, Depth= 0.74"
Routed to Link A : Ex Drainage System Rindge Ave

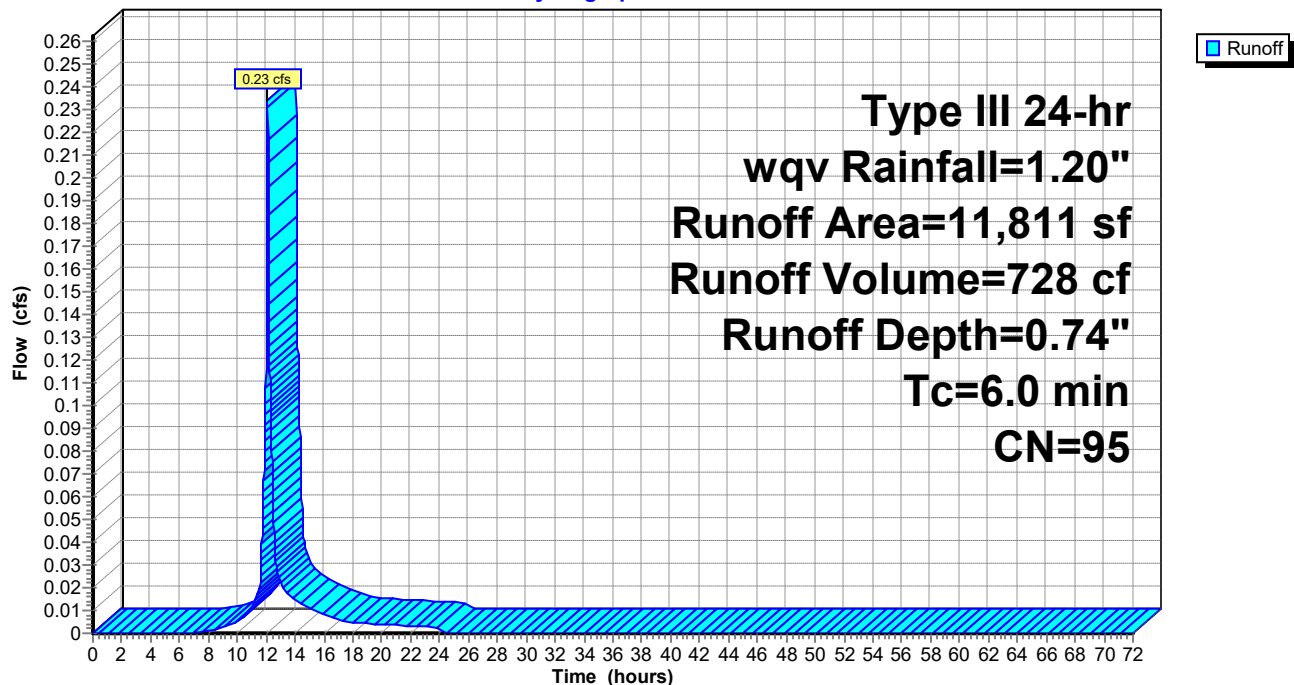
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

	Area (sf)	CN	Description
*	11,187	98	Roofs and Paved parkings
	624	39	>75% Grass cover, Good, HSG A
	11,811	95	Weighted Average
	624		5.28% Pervious Area
	11,187		94.72% Impervious Area

Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A3: Subcatchment A3

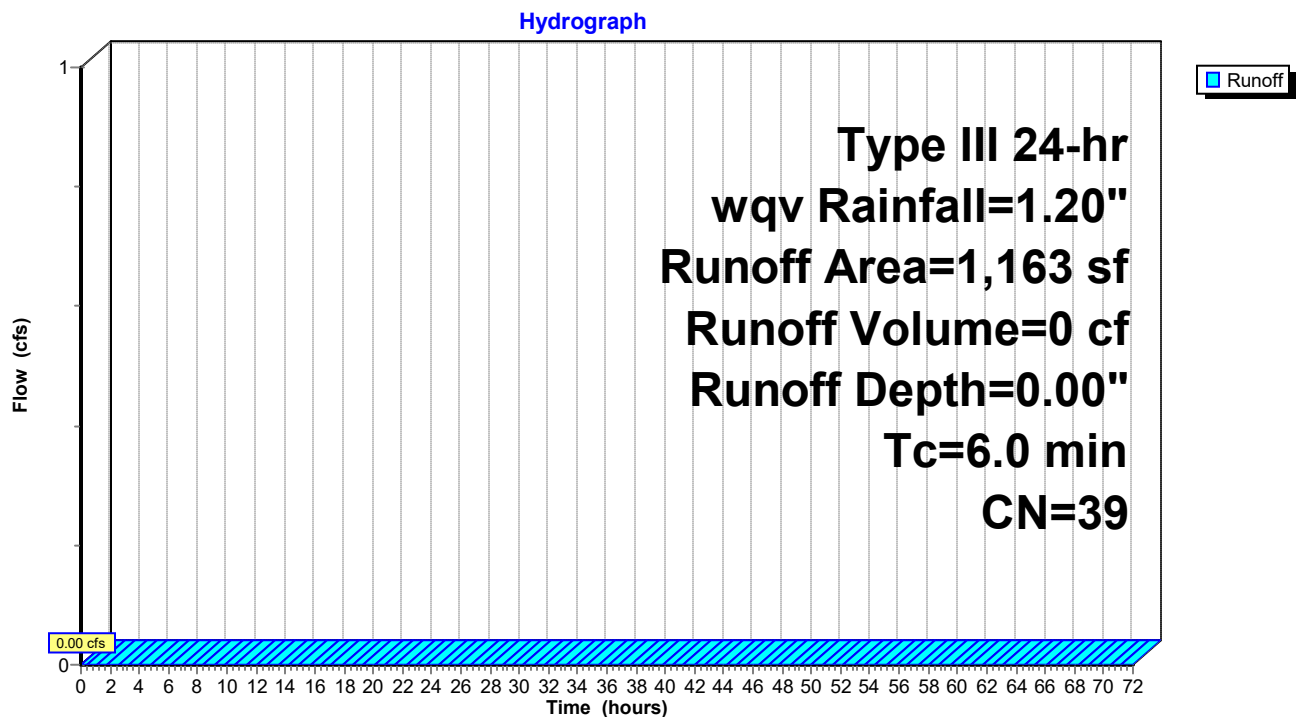
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link A : Ex Drainage System Rindge Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3: Subcatchment A3

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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment B1: Subcatchment B1

Runoff = 0.02 cfs @ 12.10 hrs, Volume= 62 cf, Depth= 0.31"
Routed to Link B : Off-Site Runoff

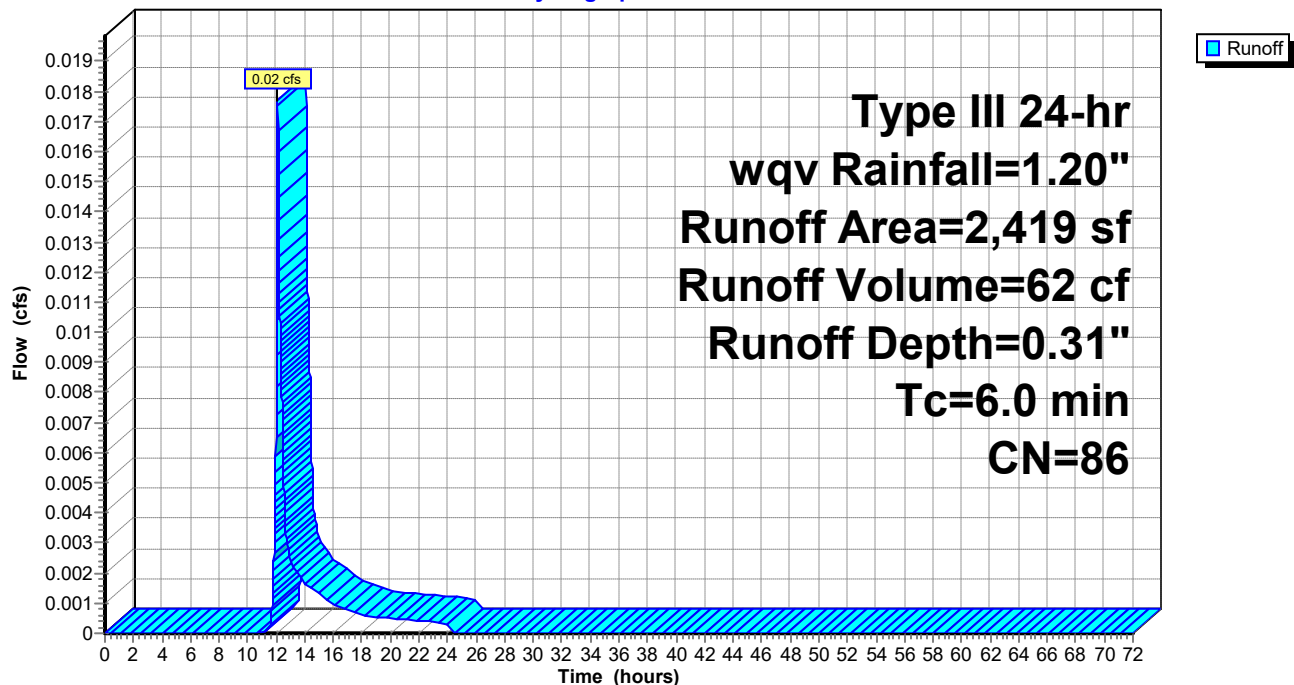
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

	Area (sf)	CN	Description
*	1,917	98	Roofs & Paved parkings
	502	39	>75% Grass cover, Good, HSG A
	2,419	86	Weighted Average
	502		20.75% Pervious Area
	1,917		79.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment B1: Subcatchment B1

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment C1: Subcatchment C1

Runoff = 0.06 cfs @ 12.08 hrs, Volume= 182 cf, Depth= 0.99"
Routed to Link C : Off-Site East Side

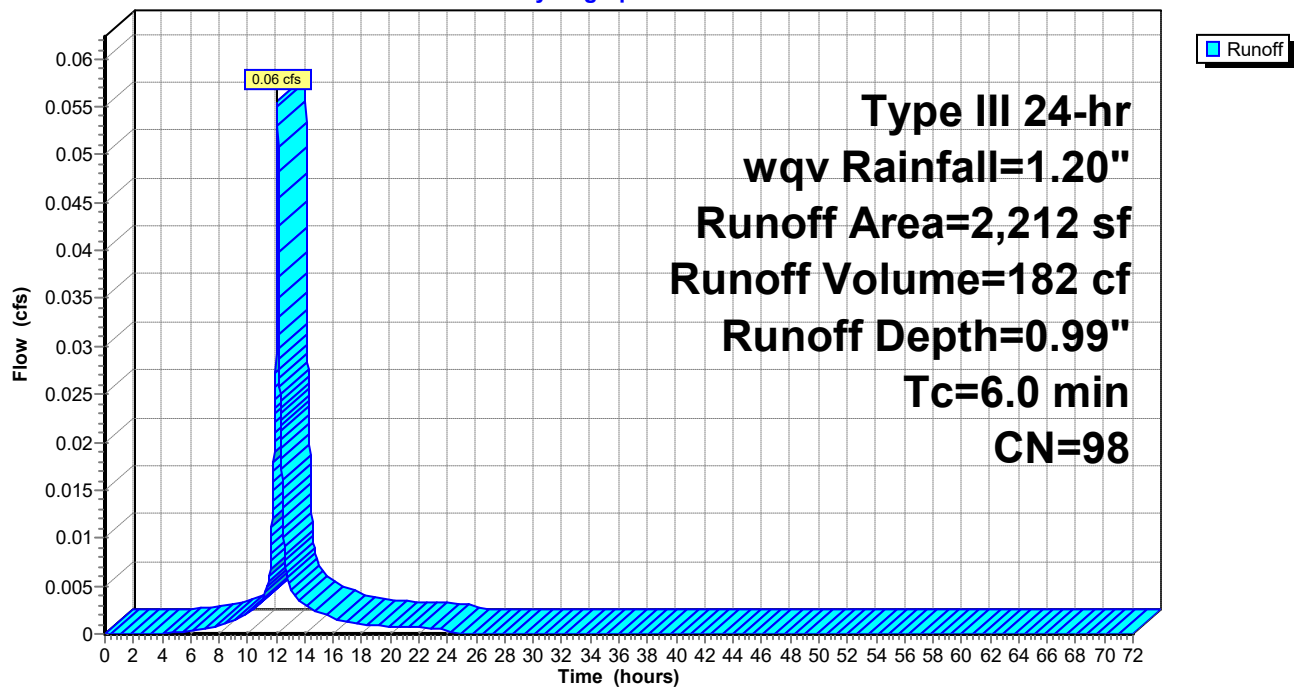
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

	Area (sf)	CN	Description
*	2,212	98	Roofs and Paved parking
	2,212		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment C1: Subcatchment C1

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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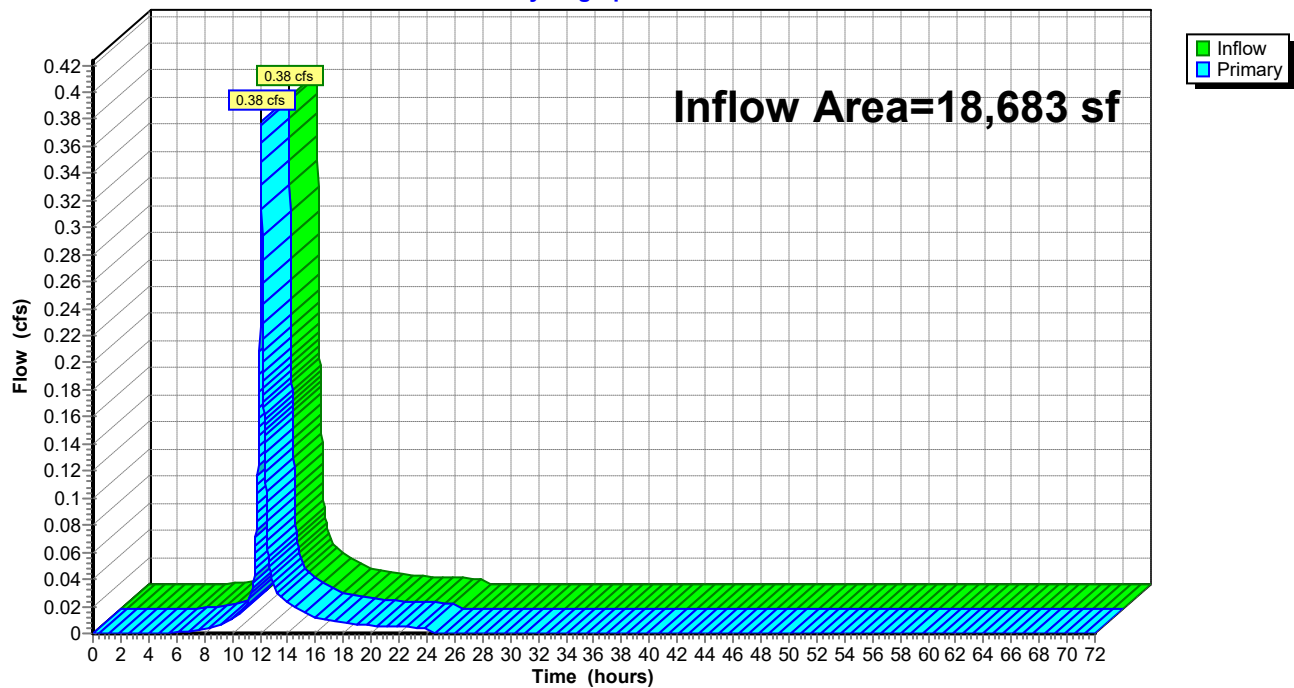
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 18,683 sf, 90.44% Impervious, Inflow Depth = 0.77" for wqv event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,197 cf
Primary = 0.38 cfs @ 12.09 hrs, Volume= 1,197 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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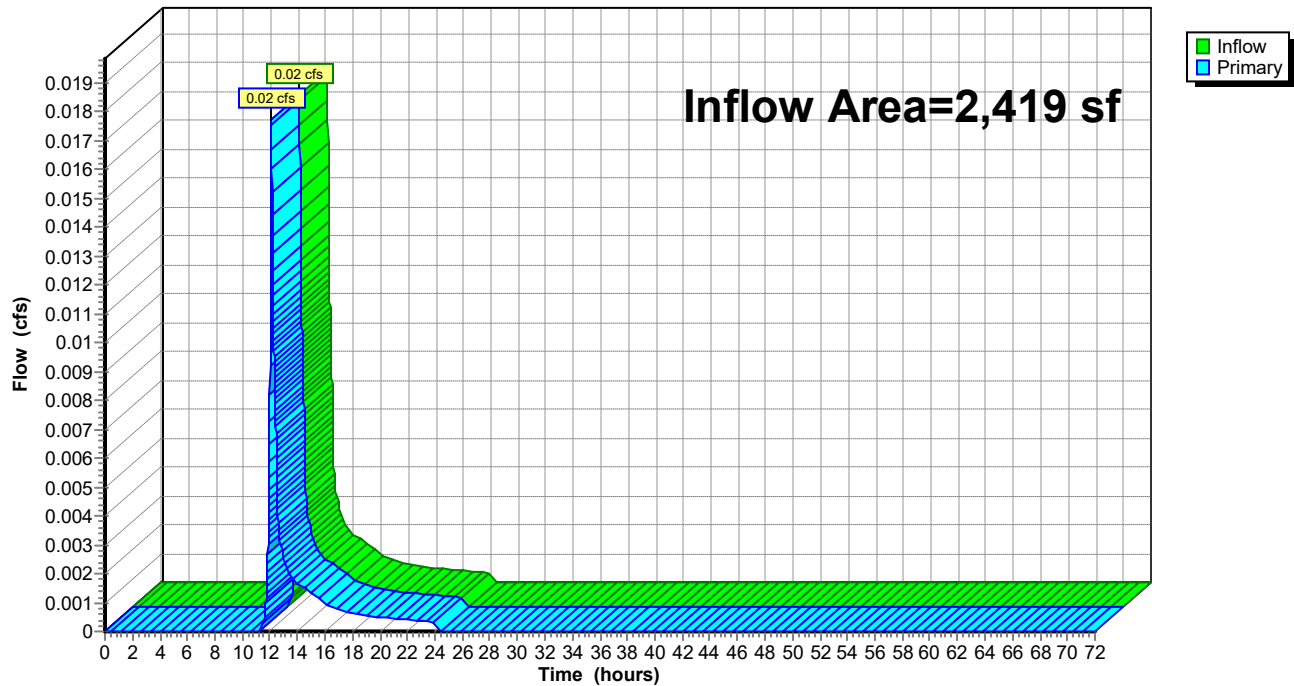
Summary for Link B: Off-Site Runoff

Inflow Area = 2,419 sf, 79.25% Impervious, Inflow Depth = 0.31" for wqv event
Inflow = 0.02 cfs @ 12.10 hrs, Volume= 62 cf
Primary = 0.02 cfs @ 12.10 hrs, Volume= 62 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link B: Off-Site Runoff

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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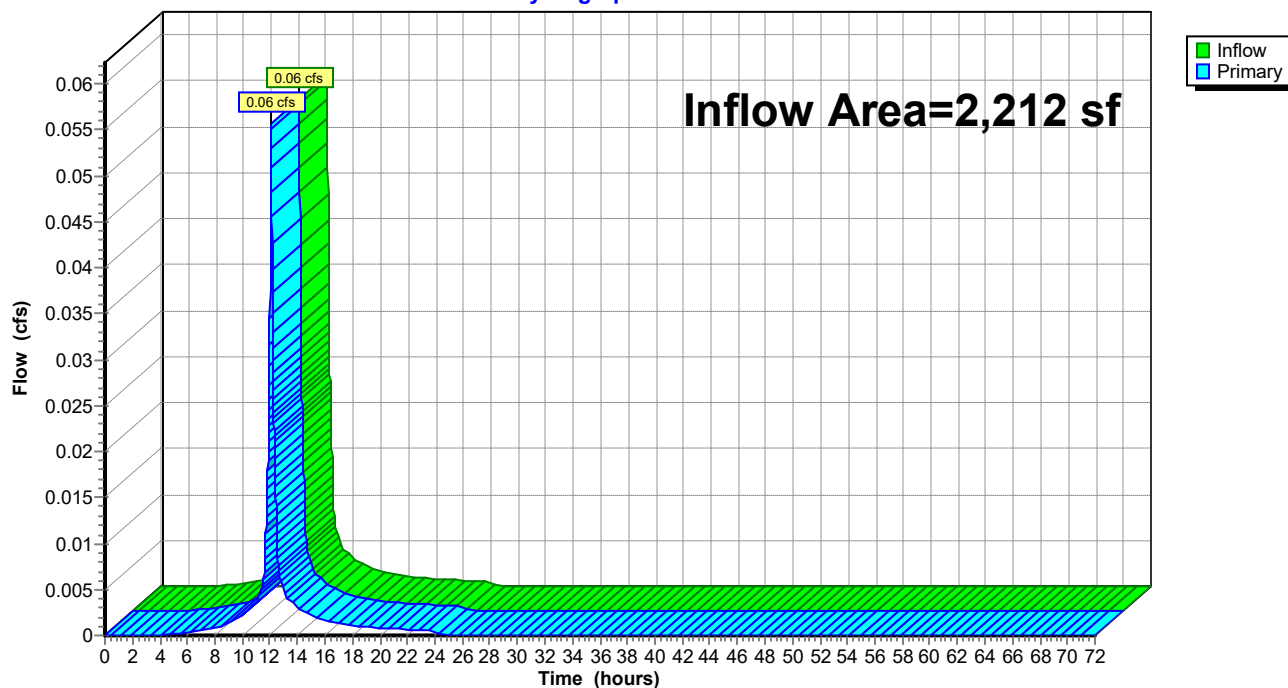
Summary for Link C: Off-Site East Side

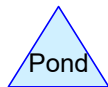
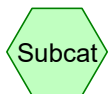
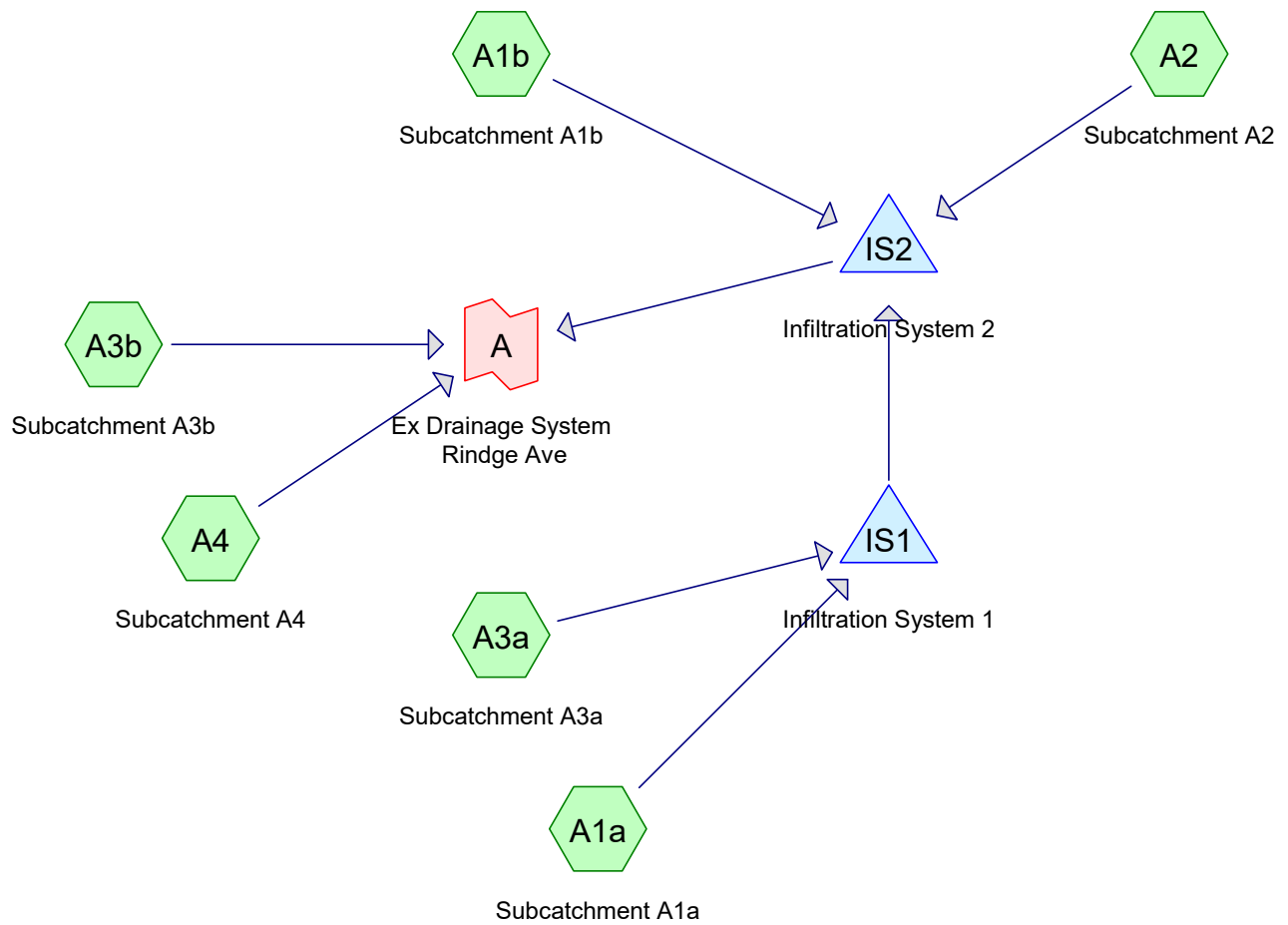
Inflow Area = 2,212 sf, 100.00% Impervious, Inflow Depth = 0.99" for wqv event
Inflow = 0.06 cfs @ 12.08 hrs, Volume= 182 cf
Primary = 0.06 cfs @ 12.08 hrs, Volume= 182 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link C: Off-Site East Side

Hydrograph





Routing Diagram for PR-HYDRO

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PR-HYDRO

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1y-6hours	Type III 24-hr		Default	24.00	1	1.72	2
2	2-year	Type III 24-hr		Default	24.00	1	3.65	2
3	10-year	Type III 24-hr		Default	24.00	1	6.40	2
4	25-year	Type III 24-hr		Default	24.00	1	8.22	2
5	100-year	Type III 24-hr		Default	24.00	1	11.70	2
6	wqv	Type III 24-hr		Default	24.00	1	1.20	2

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
767	39	>75% Grass cover, Good (A2)
4,046	39	>75% Grass cover, Good, HSG A (A3a, A3b, A4)
173	98	Paved parking (A2)
3,834	98	Paved parking, HSG A (A3a, A3b)
14,494	98	Roofs, HSG A (A1a, A1b)
23,314	86	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
22,374	HSG A	A1a, A1b, A3a, A3b, A4
0	HSG B	
0	HSG C	
0	HSG D	
940	Other	A2
23,314		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
4,046	0	0	0	767	4,813	>75% Grass cover, Good
3,834	0	0	0	173	4,007	Paved parking
14,494	0	0	0	0	14,494	Roofs
22,374	0	0	0	940	23,314	TOTAL AREA

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	IS1	23.10	22.15	95.0	0.0100	0.013	0.0	12.0	0.0	
2	IS2	18.20	15.00	27.0	0.1185	0.013	0.0	12.0	0.0	

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Type III 24-hr 1y-6hours Rainfall=1.72"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1a: Subcatchment A1a Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=98 Runoff=0.27 cfs 904 cf

Subcatchment A1b: Subcatchment A1b Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=98 Runoff=0.27 cfs 904 cf

Subcatchment A2: Subcatchment A2 Runoff Area=940 sf 18.40% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=50 Runoff=0.00 cfs 0 cf

Subcatchment A3a: Subcatchment A3a Runoff Area=3,996 sf 37.94% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=61 Runoff=0.00 cfs 9 cf

Subcatchment A3b: Subcatchment A3b Runoff Area=2,721 sf 85.19% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=89 Runoff=0.06 cfs 182 cf

Subcatchment A4: Subcatchment A4 Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Pond IS1: Infiltration System 1 Peak Elev=22.88' Storage=153 cf Inflow=0.27 cfs 914 cf
Discarded=0.08 cfs 914 cf Primary=0.00 cfs 0 cf Outflow=0.08 cfs 914 cf

Pond IS2: Infiltration System 2 Peak Elev=23.33' Storage=93 cf Inflow=0.27 cfs 904 cf
Discarded=0.12 cfs 904 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 904 cf

Link A: Ex Drainage System Rindge Ave Inflow=0.06 cfs 182 cf
Primary=0.06 cfs 182 cf

Total Runoff Area = 23,314 sf Runoff Volume = 1,999 cf Average Runoff Depth = 1.03"
20.64% Pervious = 4,813 sf 79.36% Impervious = 18,501 sf

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Type III 24-hr 1y-6hours Rainfall=1.72"

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Summary for Subcatchment A1a: Subcatchment A1a

Runoff = 0.27 cfs @ 12.08 hrs, Volume= 904 cf, Depth= 1.50"
Routed to Pond IS1 : Infiltration System 1

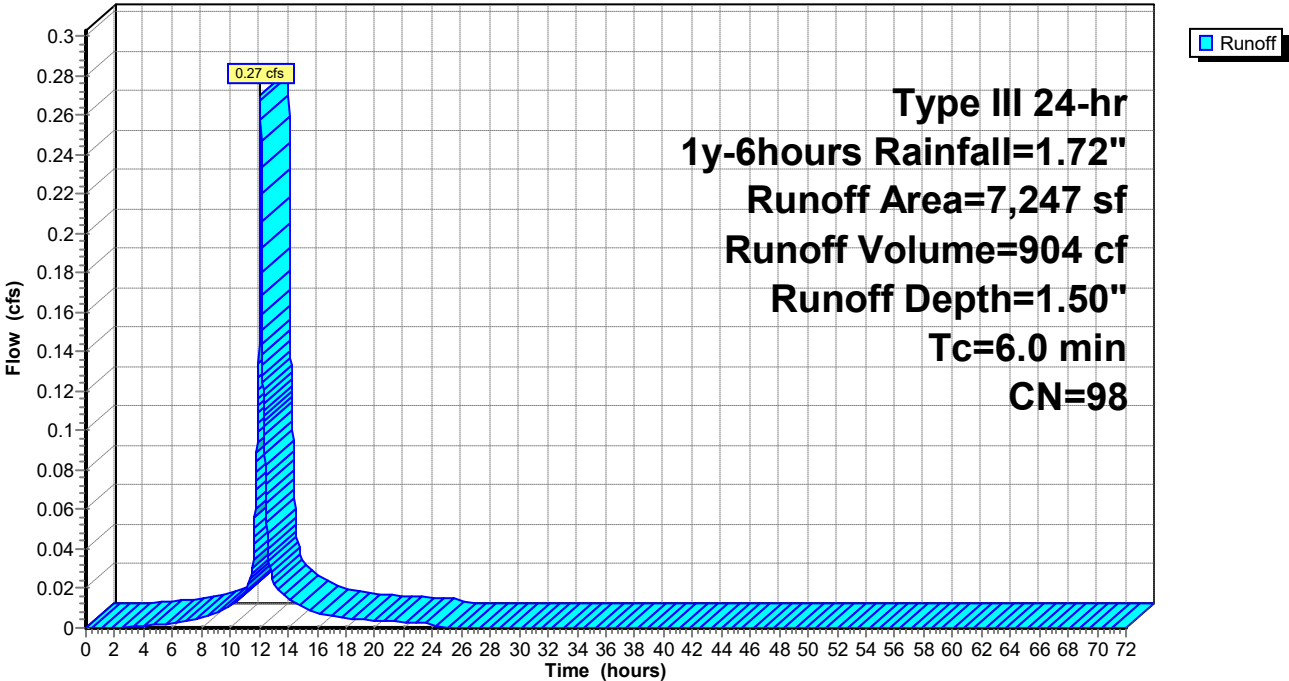
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1y-6hours Rainfall=1.72"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1a: Subcatchment A1a

Hydrograph



Summary for Subcatchment A1b: Subcatchment A1b

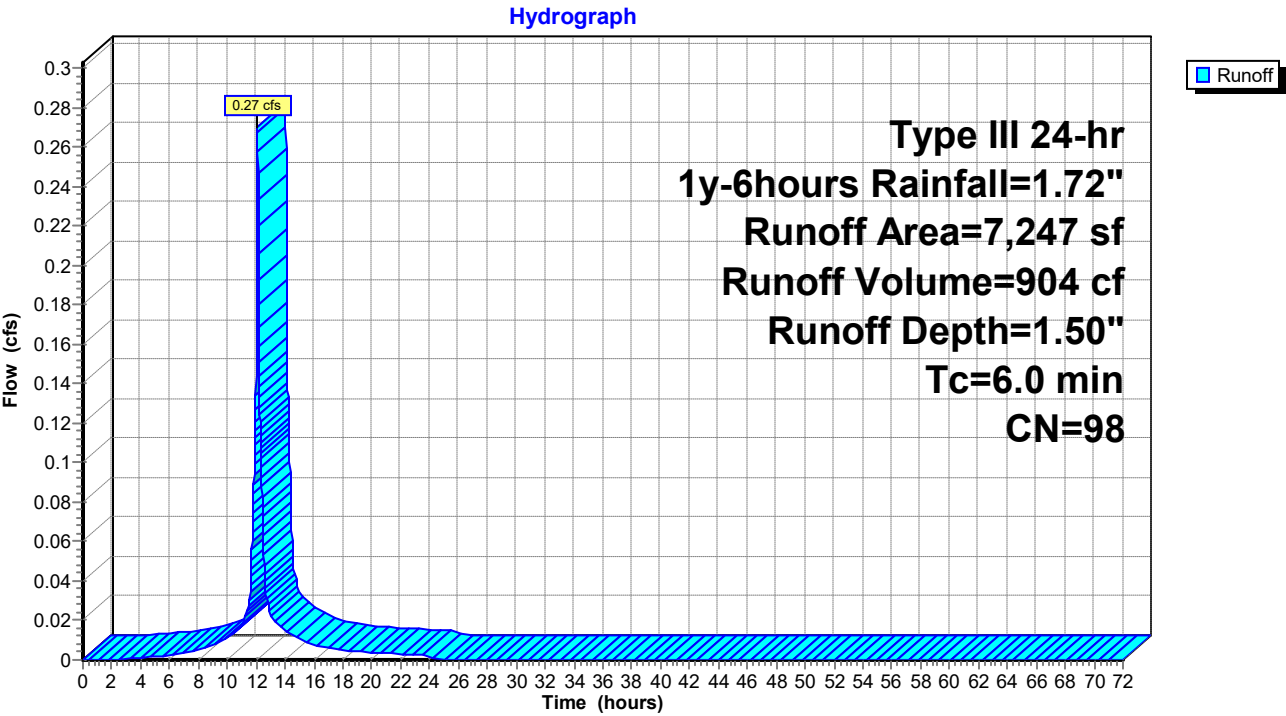
Runoff = 0.27 cfs @ 12.08 hrs, Volume= 904 cf, Depth= 1.50"
Routed to Pond IS2 : Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1y-6hours Rainfall=1.72"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1b: Subcatchment A1b



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Type III 24-hr 1y-6hours Rainfall=1.72"

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Summary for Subcatchment A2: Subcatchment A2

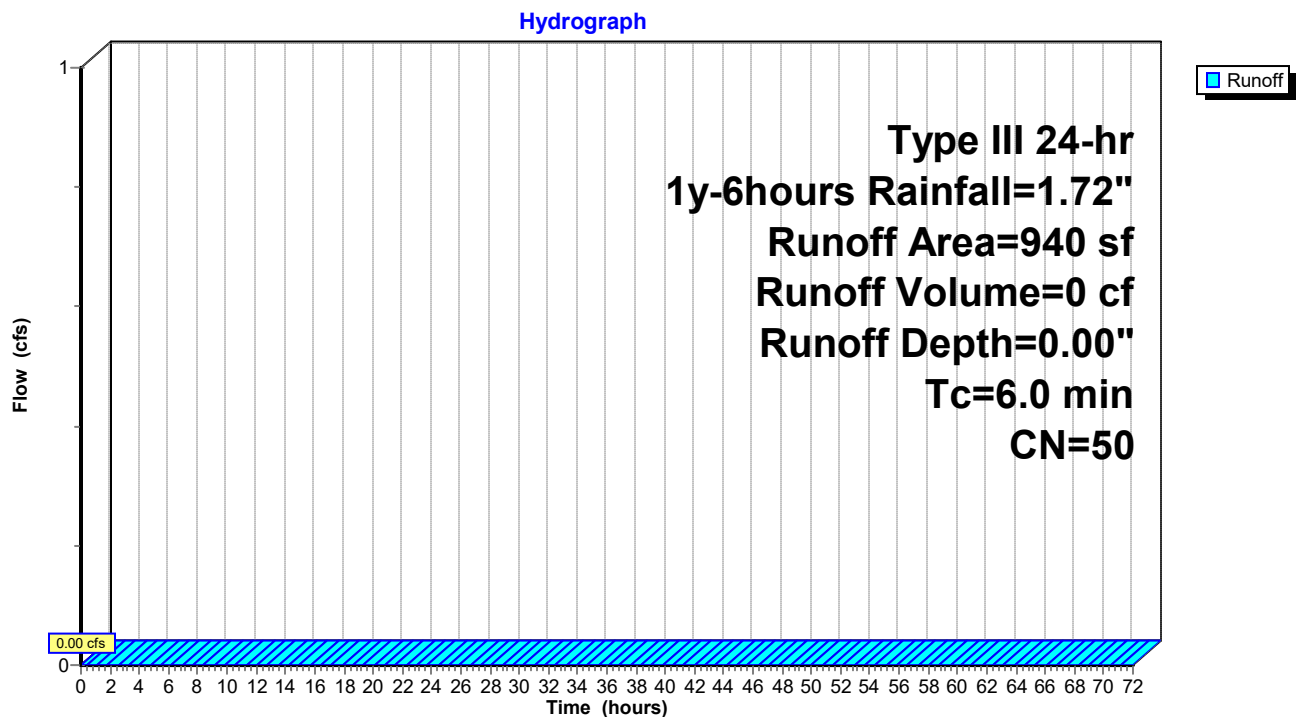
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond IS2 : Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1y-6hours Rainfall=1.72"

	Area (sf)	CN	Description
*	767	39	>75% Grass cover, Good
*	173	98	Paved parking
	940	50	Weighted Average
	767		81.60% Pervious Area
	173		18.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Summary for Subcatchment A3a: Subcatchment A3a

Runoff = 0.00 cfs @ 15.14 hrs, Volume= 9 cf, Depth= 0.03"
Routed to Pond IS1 : Infiltration System 1

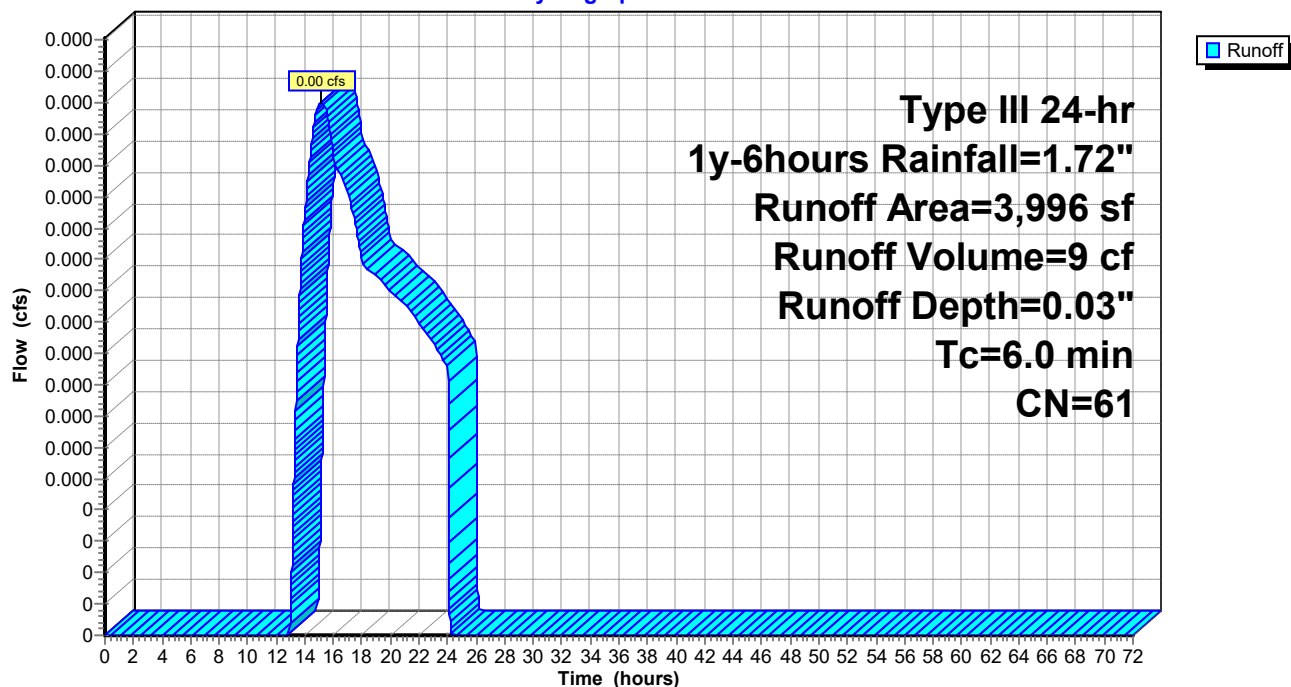
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1y-6hours Rainfall=1.72"

Area (sf)	CN	Description
1,516	98	Paved parking, HSG A
2,480	39	>75% Grass cover, Good, HSG A
3,996	61	Weighted Average
2,480		62.06% Pervious Area
1,516		37.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3a: Subcatchment A3a

Hydrograph



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Type III 24-hr 1y-6hours Rainfall=1.72"

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Summary for Subcatchment A3b: Subcatchment A3b

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 182 cf, Depth= 0.80"
Routed to Link A : Ex Drainage System Rindge Ave

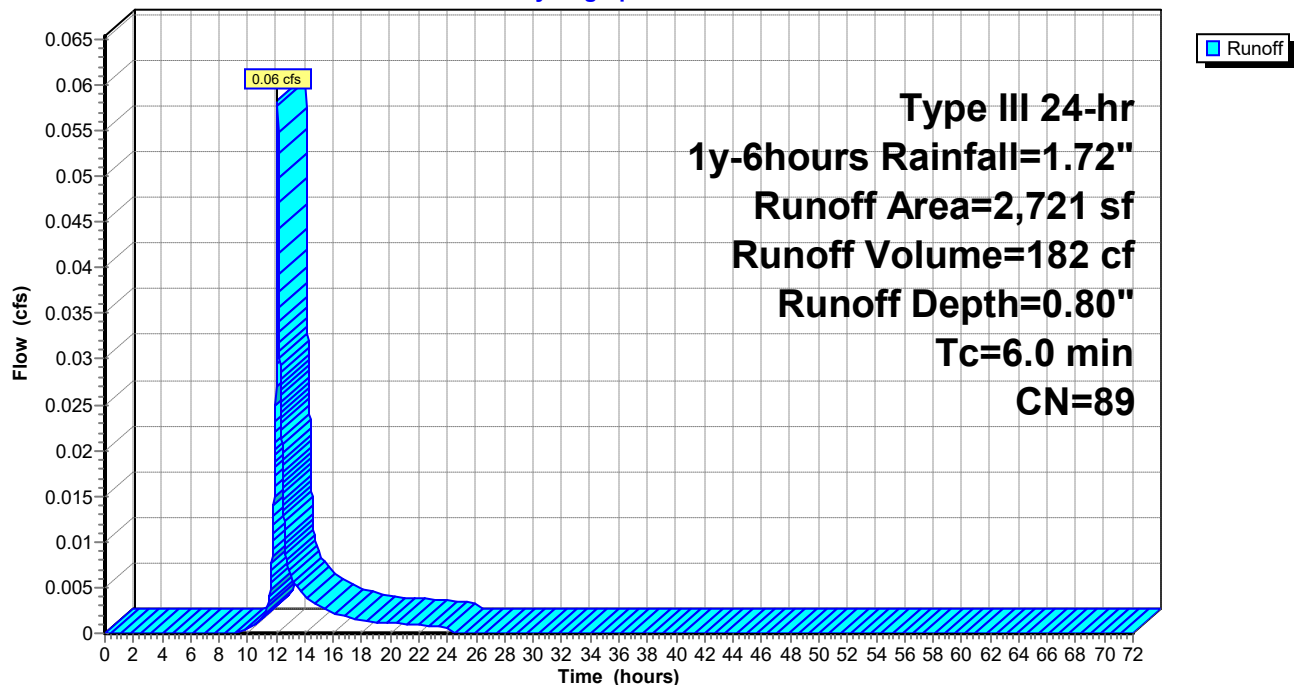
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1y-6hours Rainfall=1.72"

Area (sf)	CN	Description
2,318	98	Paved parking, HSG A
403	39	>75% Grass cover, Good, HSG A
2,721	89	Weighted Average
403		14.81% Pervious Area
2,318		85.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3b: Subcatchment A3b

Hydrograph



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Type III 24-hr 1y-6hours Rainfall=1.72"

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Summary for Subcatchment A4: Subcatchment A4

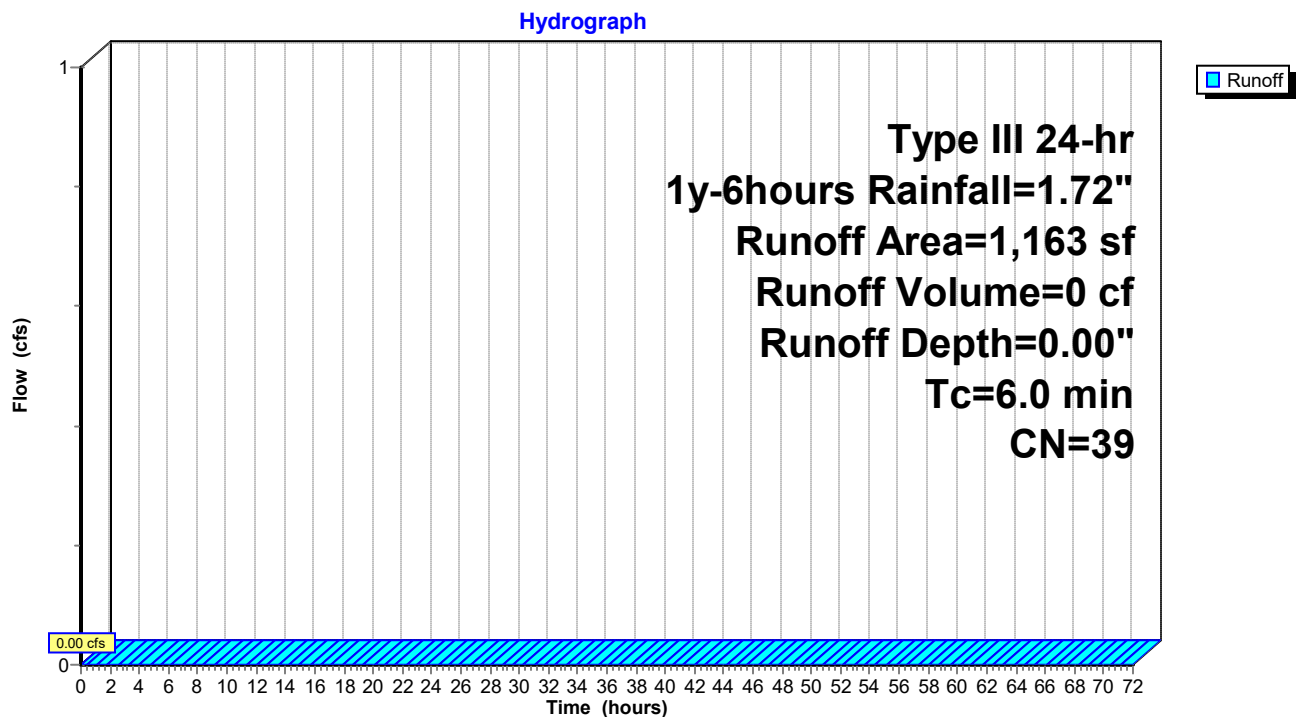
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link A : Ex Drainage System Rindge Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1y-6hours Rainfall=1.72"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment A4: Subcatchment A4

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Type III 24-hr 1y-6hours Rainfall=1.72"

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Summary for Pond IS1: Infiltration System 1

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 0.98" for 1y-6hours event
 Inflow = 0.27 cfs @ 12.08 hrs, Volume= 914 cf
 Outflow = 0.08 cfs @ 12.40 hrs, Volume= 914 cf, Atten= 70%, Lag= 19.1 min
 Discarded = 0.08 cfs @ 12.40 hrs, Volume= 914 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 22.88' @ 12.40 hrs Surf.Area= 1,361 sf Storage= 153 cf

Plug-Flow detention time= 9.1 min calculated for 914 cf (100% of inflow)
 Center-of-Mass det. time= 9.1 min (783.9 - 774.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.10'	12.0" Round Culvert L= 95.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.10' / 22.15' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.05'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.08 cfs @ 12.40 hrs HW=22.88' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.60' TW=22.90' (Dynamic Tailwater)
 ↑ **1=Culvert** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 1y-6hours Rainfall=1.72"

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Pond IS1: Infiltration System 1 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

61 Chambers/Row x 2.35' Long = 143.09' Row Length +24.0" End Stone x 2 = 147.09' Base Length

4 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 9.25' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

244 Chambers x 8.6 cf = 2,107.1 cf Chamber Storage

244 Chambers x 9.1 cf = 2,218.0 cf Displacement

5,377.8 cf Field - 2,218.0 cf Chambers = 3,159.9 cf Stone x 40.0% Voids = 1,263.9 cf Stone Storage

Chamber Storage + Stone Storage = 3,371.0 cf = 0.077 af

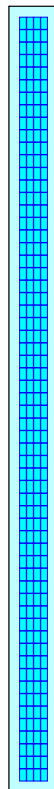
Overall Storage Efficiency = 62.7%

Overall System Size = 147.09' x 9.25' x 3.95'

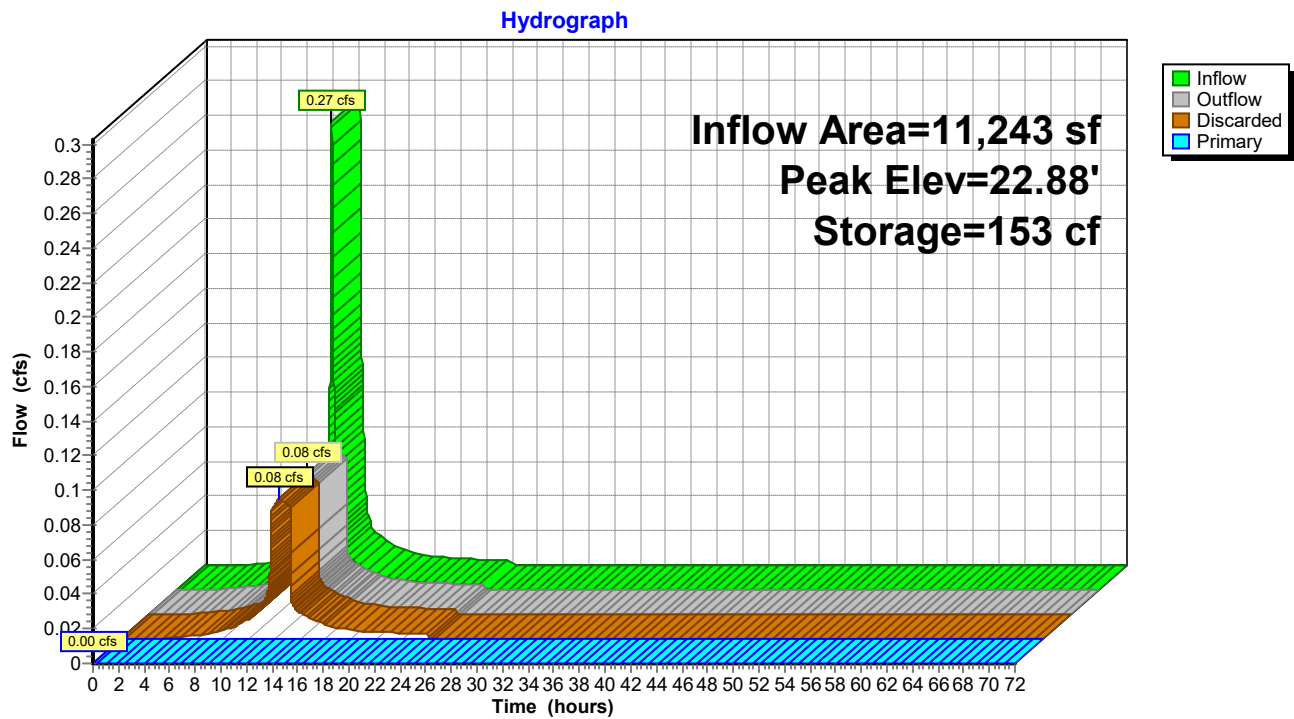
244 Chambers

199.2 cy Field

117.0 cy Stone



Pond IS1: Infiltration System 1



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Type III 24-hr 1y-6hours Rainfall=1.72"

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Summary for Pond IS2: Infiltration System 2

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 0.56" for 1y-6hours event
 Inflow = 0.27 cfs @ 12.08 hrs, Volume= 904 cf
 Outflow = 0.12 cfs @ 12.28 hrs, Volume= 904 cf, Atten= 57%, Lag= 11.5 min
 Discarded = 0.12 cfs @ 12.28 hrs, Volume= 904 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 23.33' @ 12.28 hrs Surf.Area= 549 sf Storage= 93 cf

Plug-Flow detention time= 3.3 min calculated for 904 cf (100% of inflow)
 Center-of-Mass det. time= 3.3 min (774.8 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.20'	12.0" Round Culvert L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.20' / 15.00' S= 0.1185 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.90'	8.310 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.30'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.12 cfs @ 12.28 hrs HW=23.33' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.90' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.00 cfs of 6.12 cfs potential flow)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 1y-6hours Rainfall=1.72"

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Pond IS2: Infiltration System 2 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

18 Chambers/Row x 2.35' Long = 42.22' Row Length +24.0" End Stone x 2 = 46.22' Base Length

6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

108 Chambers x 8.6 cf = 932.6 cf Chamber Storage

108 Chambers x 9.1 cf = 981.7 cf Displacement

2,169.5 cf Field - 981.7 cf Chambers = 1,187.8 cf Stone x 40.0% Voids = 475.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,407.8 cf = 0.032 af

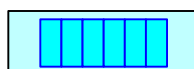
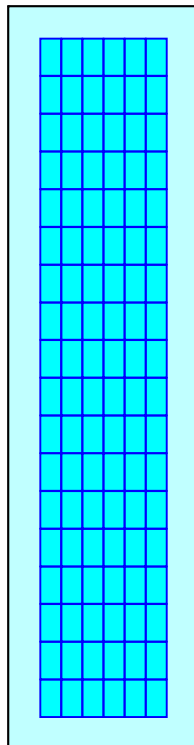
Overall Storage Efficiency = 64.9%

Overall System Size = 46.22' x 11.87' x 3.95'

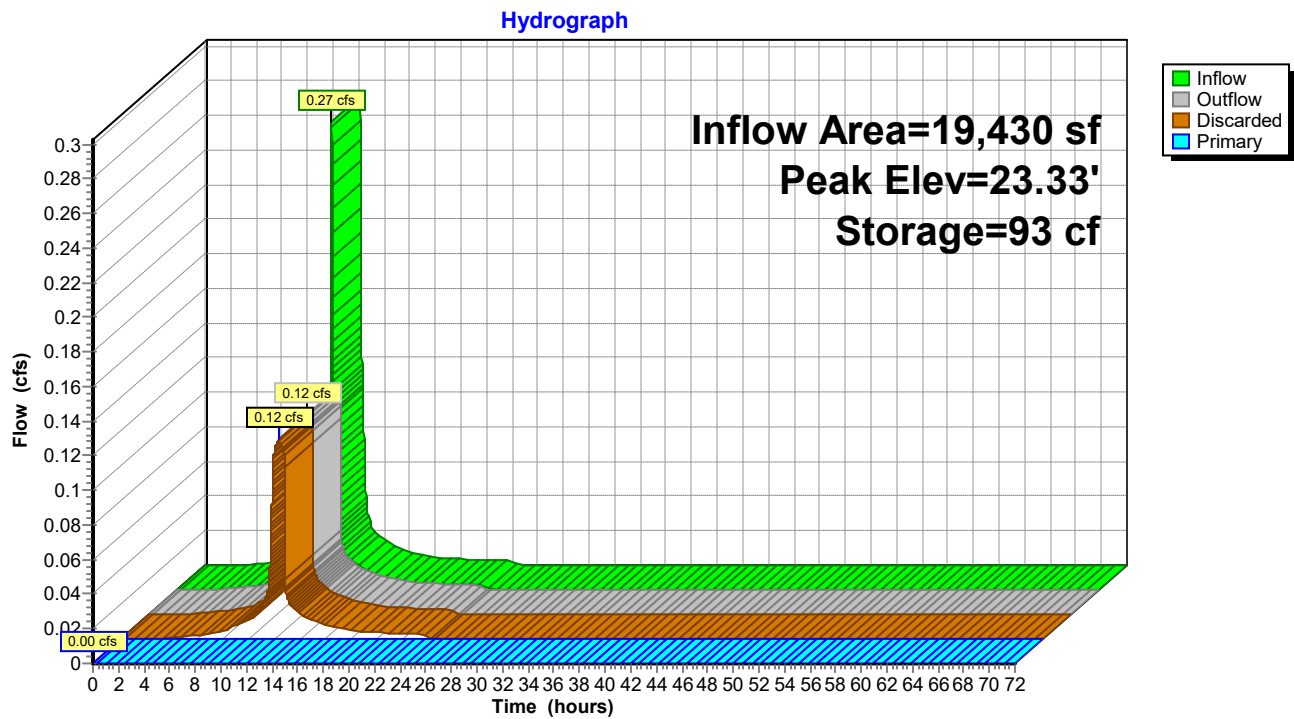
108 Chambers

80.4 cy Field

44.0 cy Stone



Pond IS2: Infiltration System 2



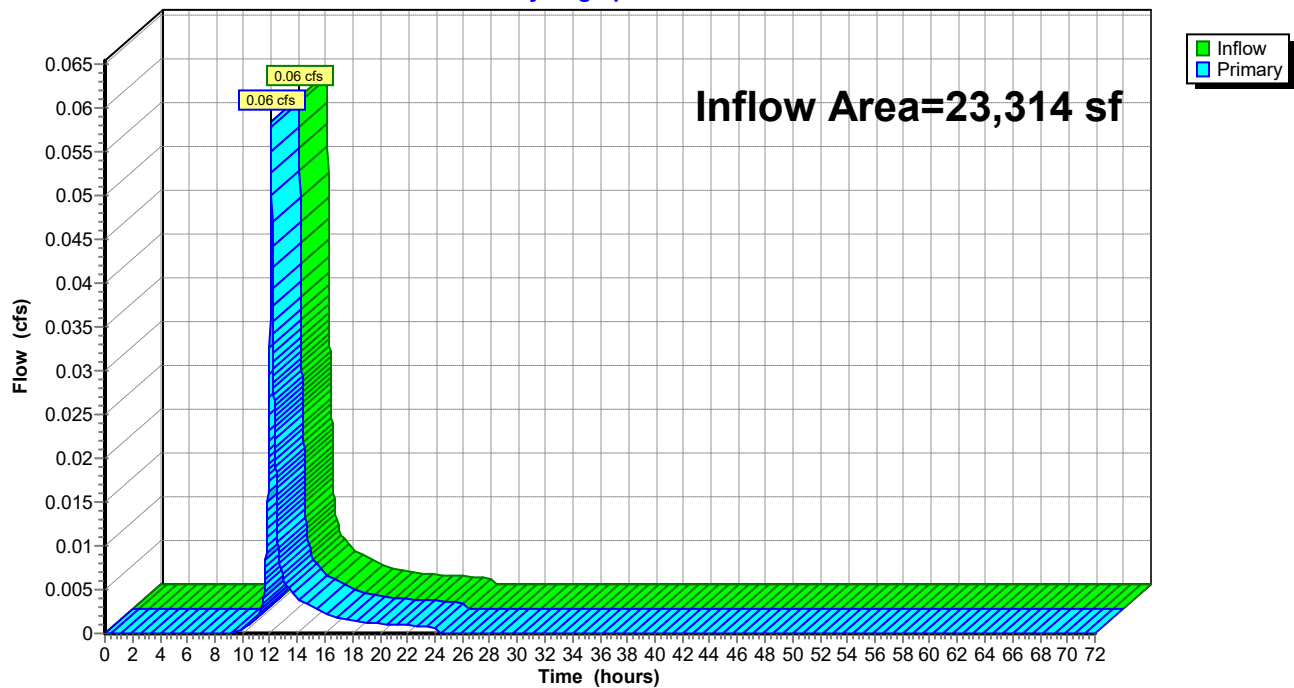
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 23,314 sf, 79.36% Impervious, Inflow Depth = 0.09" for 1y-6hours event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 182 cf
Primary = 0.06 cfs @ 12.09 hrs, Volume= 182 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1a: Subcatchment A1a Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=3.42"
Tc=6.0 min CN=98 Runoff=0.59 cfs 2,063 cf

Subcatchment A1b: Subcatchment A1b Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=3.42"
Tc=6.0 min CN=98 Runoff=0.59 cfs 2,063 cf

Subcatchment A2: Subcatchment A2 Runoff Area=940 sf 18.40% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=50 Runoff=0.00 cfs 18 cf

Subcatchment A3a: Subcatchment A3a Runoff Area=3,996 sf 37.94% Impervious Runoff Depth=0.64"
Tc=6.0 min CN=61 Runoff=0.05 cfs 214 cf

Subcatchment A3b: Subcatchment A3b Runoff Area=2,721 sf 85.19% Impervious Runoff Depth=2.50"
Tc=6.0 min CN=89 Runoff=0.18 cfs 566 cf

Subcatchment A4: Subcatchment A4 Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.02"
Tc=6.0 min CN=39 Runoff=0.00 cfs 2 cf

Pond IS1: Infiltration System 1 Peak Elev=23.50' Storage=651 cf Inflow=0.64 cfs 2,277 cf
Discarded=0.09 cfs 2,277 cf Primary=0.00 cfs 0 cf Outflow=0.09 cfs 2,277 cf

Pond IS2: Infiltration System 2 Peak Elev=24.26' Storage=457 cf Inflow=0.59 cfs 2,081 cf
Discarded=0.14 cfs 2,081 cf Primary=0.00 cfs 0 cf Outflow=0.14 cfs 2,081 cf

Link A: Ex Drainage System Rindge Ave Inflow=0.18 cfs 568 cf
Primary=0.18 cfs 568 cf

Total Runoff Area = 23,314 sf Runoff Volume = 4,926 cf Average Runoff Depth = 2.54"
20.64% Pervious = 4,813 sf 79.36% Impervious = 18,501 sf

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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment A1a: Subcatchment A1a

Runoff = 0.59 cfs @ 12.08 hrs, Volume= 2,063 cf, Depth= 3.42"
Routed to Pond IS1 : Infiltration System 1

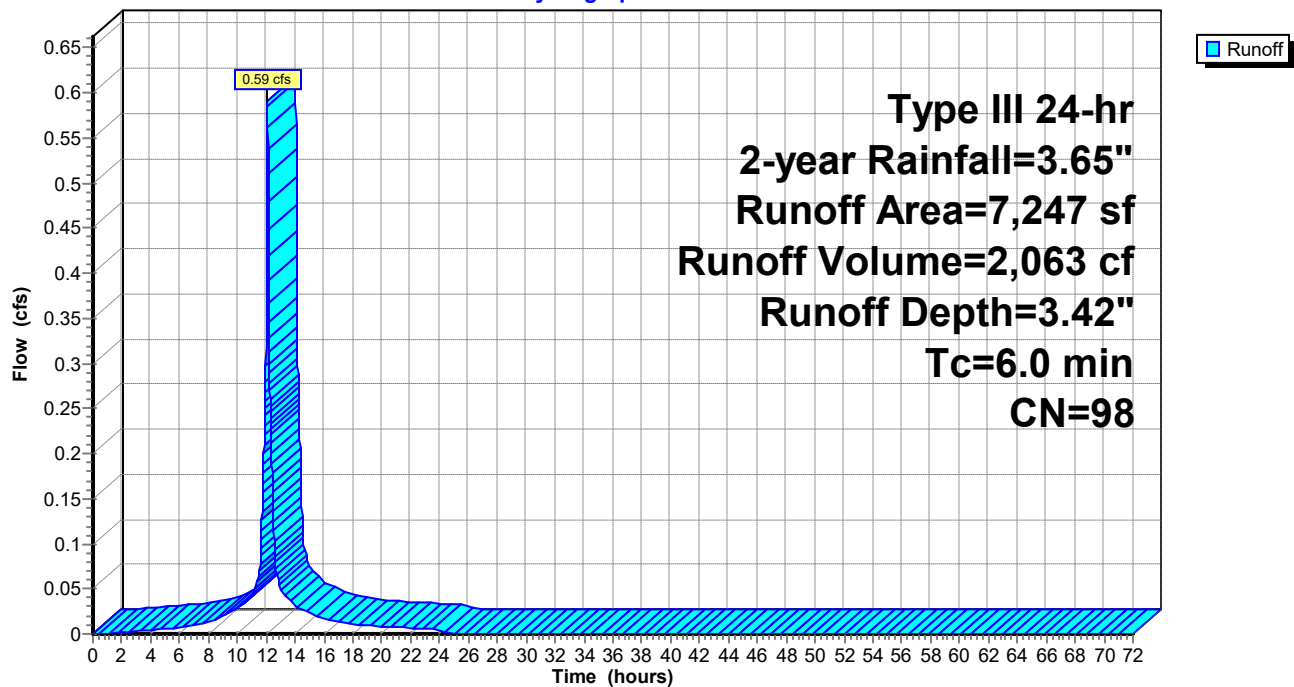
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1a: Subcatchment A1a

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment A1b: Subcatchment A1b

Runoff = 0.59 cfs @ 12.08 hrs, Volume= 2,063 cf, Depth= 3.42"
Routed to Pond IS2 : Infiltration System 2

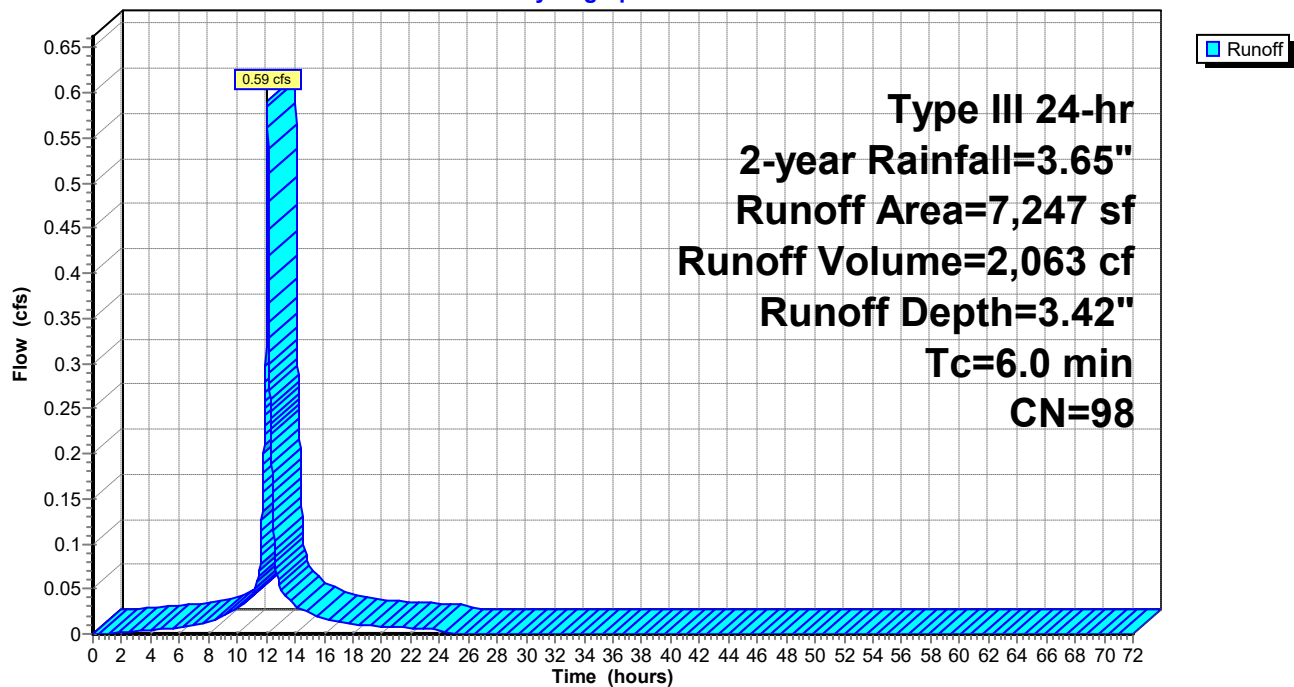
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1b: Subcatchment A1b

Hydrograph



Summary for Subcatchment A2: Subcatchment A2

Runoff = 0.00 cfs @ 12.37 hrs, Volume= 18 cf, Depth= 0.23"
Routed to Pond IS2 : Infiltration System 2

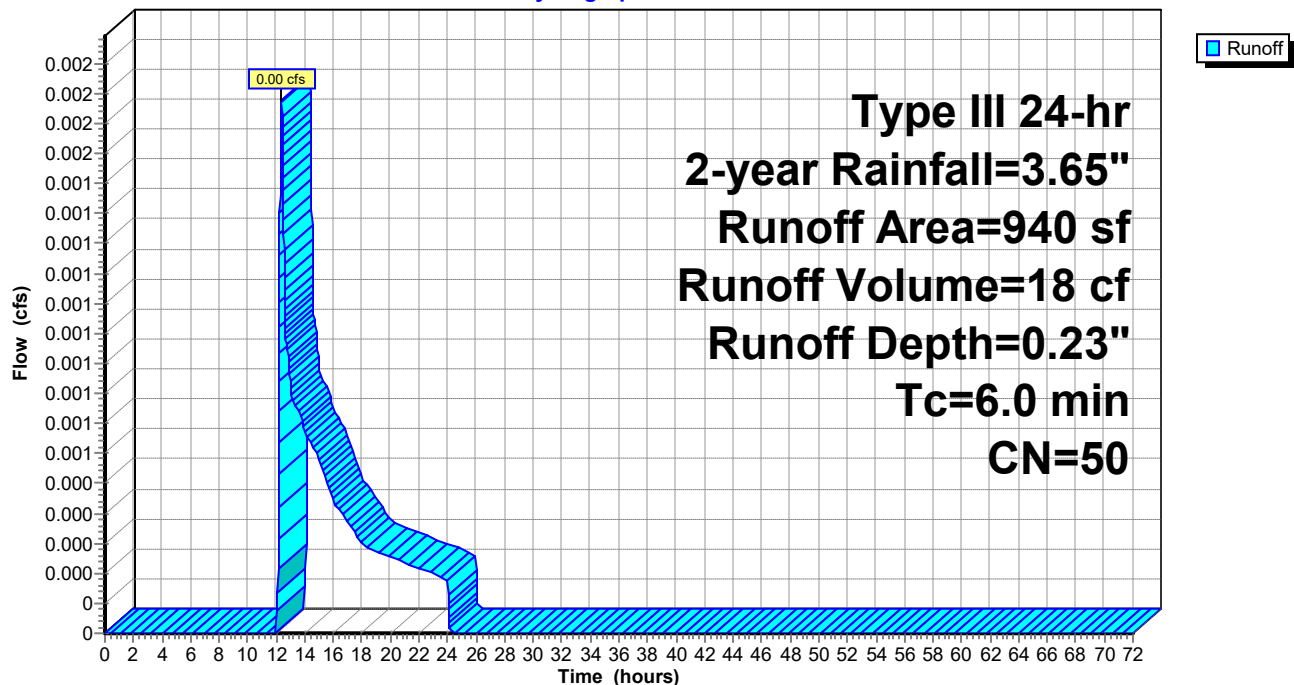
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

	Area (sf)	CN	Description
*	767	39	>75% Grass cover, Good
*	173	98	Paved parking
	940	50	Weighted Average
	767		81.60% Pervious Area
	173		18.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment A3a: Subcatchment A3a

Runoff = 0.05 cfs @ 12.11 hrs, Volume= 214 cf, Depth= 0.64"
Routed to Pond IS1 : Infiltration System 1

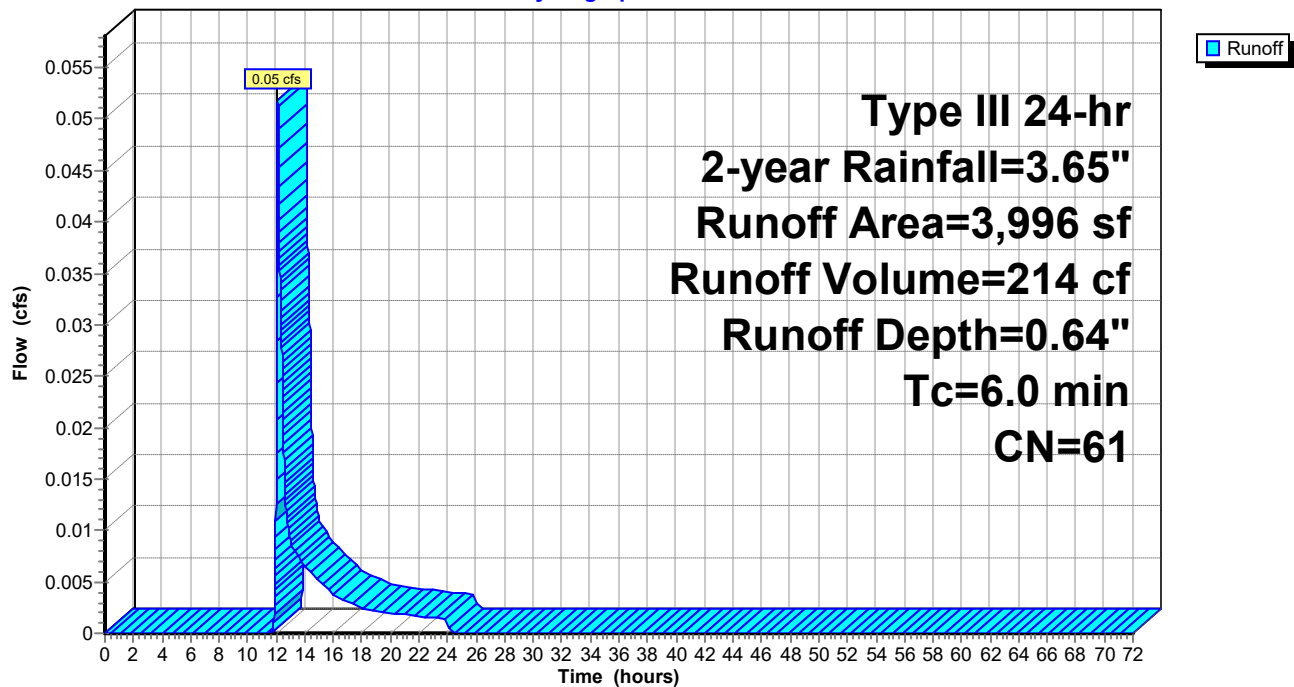
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

Area (sf)	CN	Description
1,516	98	Paved parking, HSG A
2,480	39	>75% Grass cover, Good, HSG A
3,996	61	Weighted Average
2,480		62.06% Pervious Area
1,516		37.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3a: Subcatchment A3a

Hydrograph



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Summary for Subcatchment A3b: Subcatchment A3b

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 566 cf, Depth= 2.50"
Routed to Link A : Ex Drainage System Rindge Ave

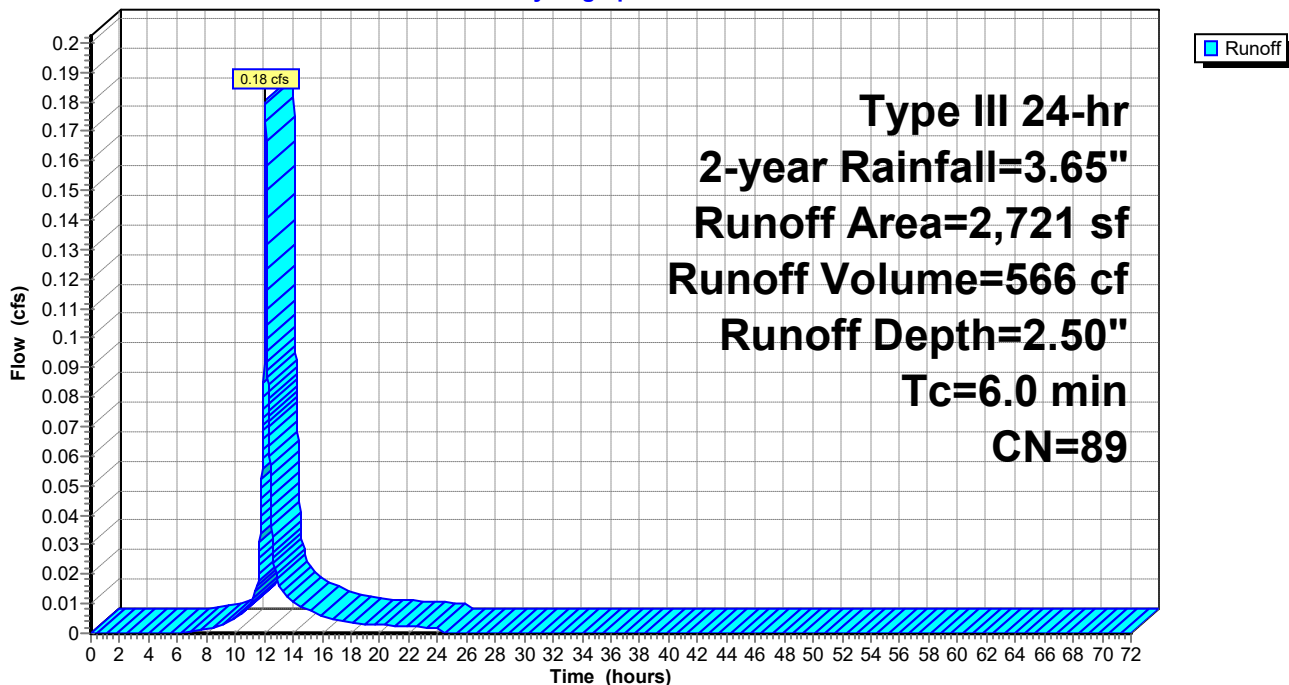
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

Area (sf)	CN	Description
2,318	98	Paved parking, HSG A
403	39	>75% Grass cover, Good, HSG A
2,721	89	Weighted Average
403		14.81% Pervious Area
2,318		85.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3b: Subcatchment A3b

Hydrograph



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Type III 24-hr 2-year Rainfall=3.65"

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Summary for Subcatchment A4: Subcatchment A4

Runoff = 0.00 cfs @ 21.34 hrs, Volume= 2 cf, Depth= 0.02"
Routed to Link A : Ex Drainage System Rindge Ave

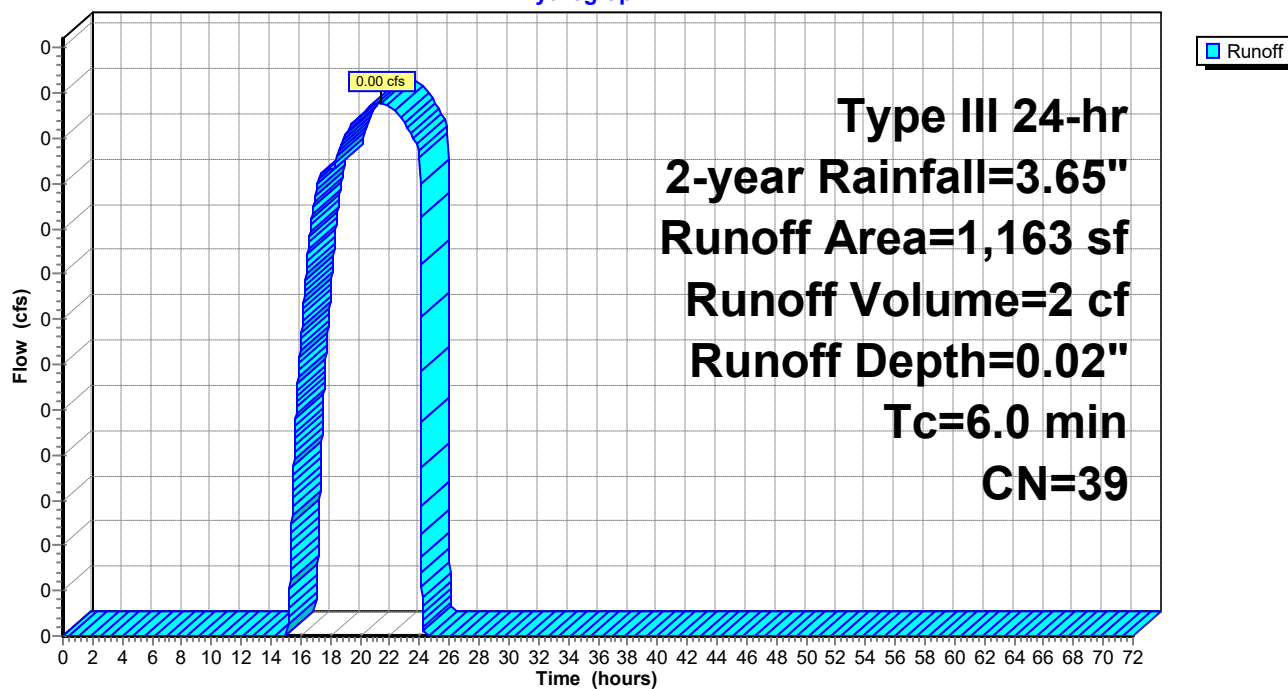
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.65"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment A4: Subcatchment A4

Hydrograph



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Summary for Pond IS1: Infiltration System 1

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 2.43" for 2-year event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,277 cf
Outflow = 0.09 cfs @ 12.60 hrs, Volume= 2,277 cf, Atten= 86%, Lag= 31.0 min
Discarded = 0.09 cfs @ 12.60 hrs, Volume= 2,277 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 23.50' @ 12.60 hrs Surf.Area= 1,361 sf Storage= 651 cf

Plug-Flow detention time= 45.0 min calculated for 2,276 cf (100% of inflow)
Center-of-Mass det. time= 45.0 min (812.4 - 767.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.10'	12.0" Round Culvert L= 95.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.10' / 22.15' S= 0.0100 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.05'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.09 cfs @ 12.60 hrs HW=23.50' (Free Discharge)
↑ **2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.60' TW=22.90' (Dynamic Tailwater)
↑ **1=Culvert** (Controls 0.00 cfs)
↑ **3=Orifice/Grate** (Controls 0.00 cfs)
↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 2-year Rainfall=3.65"

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Pond IS1: Infiltration System 1 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

61 Chambers/Row x 2.35' Long = 143.09' Row Length +24.0" End Stone x 2 = 147.09' Base Length

4 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 9.25' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

244 Chambers x 8.6 cf = 2,107.1 cf Chamber Storage

244 Chambers x 9.1 cf = 2,218.0 cf Displacement

5,377.8 cf Field - 2,218.0 cf Chambers = 3,159.9 cf Stone x 40.0% Voids = 1,263.9 cf Stone Storage

Chamber Storage + Stone Storage = 3,371.0 cf = 0.077 af

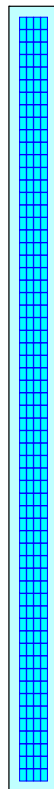
Overall Storage Efficiency = 62.7%

Overall System Size = 147.09' x 9.25' x 3.95'

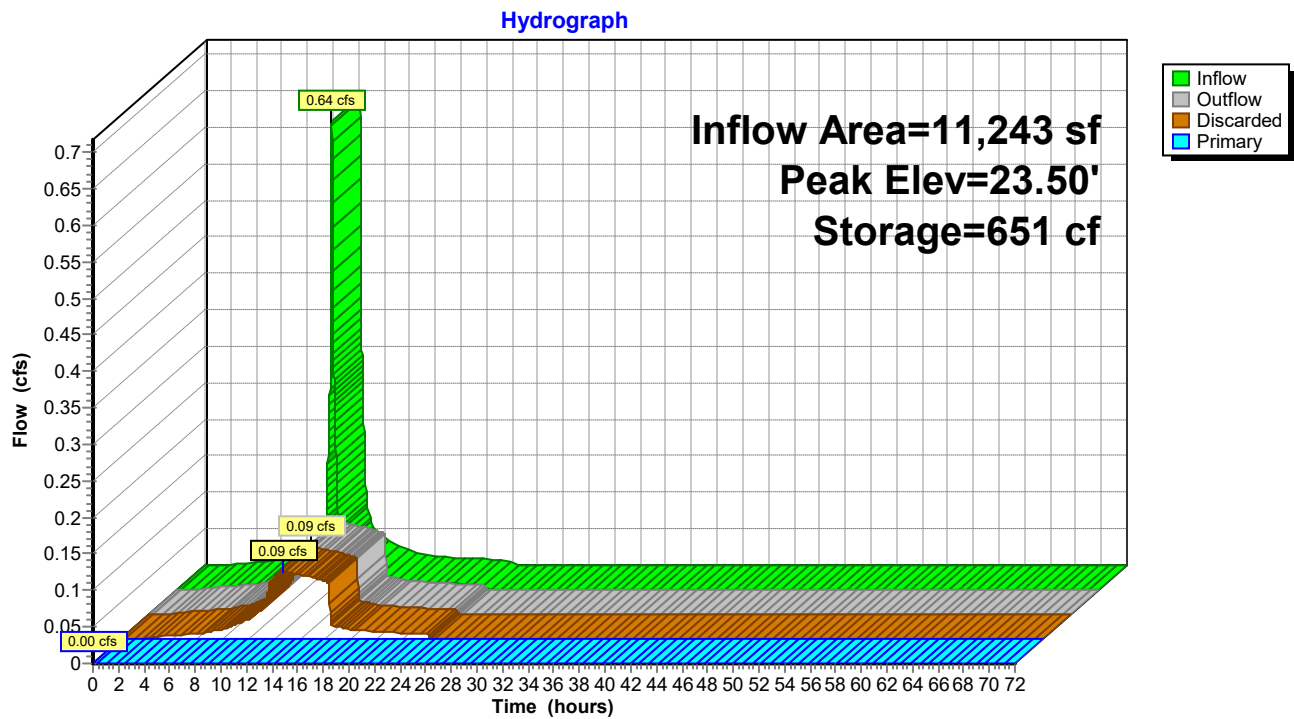
244 Chambers

199.2 cy Field

117.0 cy Stone



Pond IS1: Infiltration System 1



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Summary for Pond IS2: Infiltration System 2

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 1.29" for 2-year event
 Inflow = 0.59 cfs @ 12.08 hrs, Volume= 2,081 cf
 Outflow = 0.14 cfs @ 12.48 hrs, Volume= 2,081 cf, Atten= 77%, Lag= 23.6 min
 Discarded = 0.14 cfs @ 12.48 hrs, Volume= 2,081 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 24.26' @ 12.48 hrs Surf.Area= 549 sf Storage= 457 cf

Plug-Flow detention time= 17.4 min calculated for 2,081 cf (100% of inflow)
 Center-of-Mass det. time= 17.3 min (773.0 - 755.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.20'	12.0" Round Culvert L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.20' / 15.00' S= 0.1185 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.90'	8.310 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.30'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.14 cfs @ 12.48 hrs HW=24.26' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.90' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.00 cfs of 6.12 cfs potential flow)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 2-year Rainfall=3.65"

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Pond IS2: Infiltration System 2 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

18 Chambers/Row x 2.35' Long = 42.22' Row Length +24.0" End Stone x 2 = 46.22' Base Length

6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

108 Chambers x 8.6 cf = 932.6 cf Chamber Storage

108 Chambers x 9.1 cf = 981.7 cf Displacement

2,169.5 cf Field - 981.7 cf Chambers = 1,187.8 cf Stone x 40.0% Voids = 475.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,407.8 cf = 0.032 af

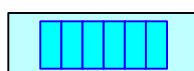
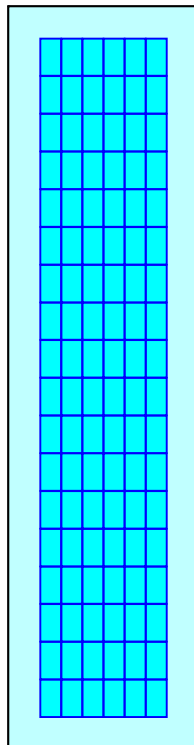
Overall Storage Efficiency = 64.9%

Overall System Size = 46.22' x 11.87' x 3.95'

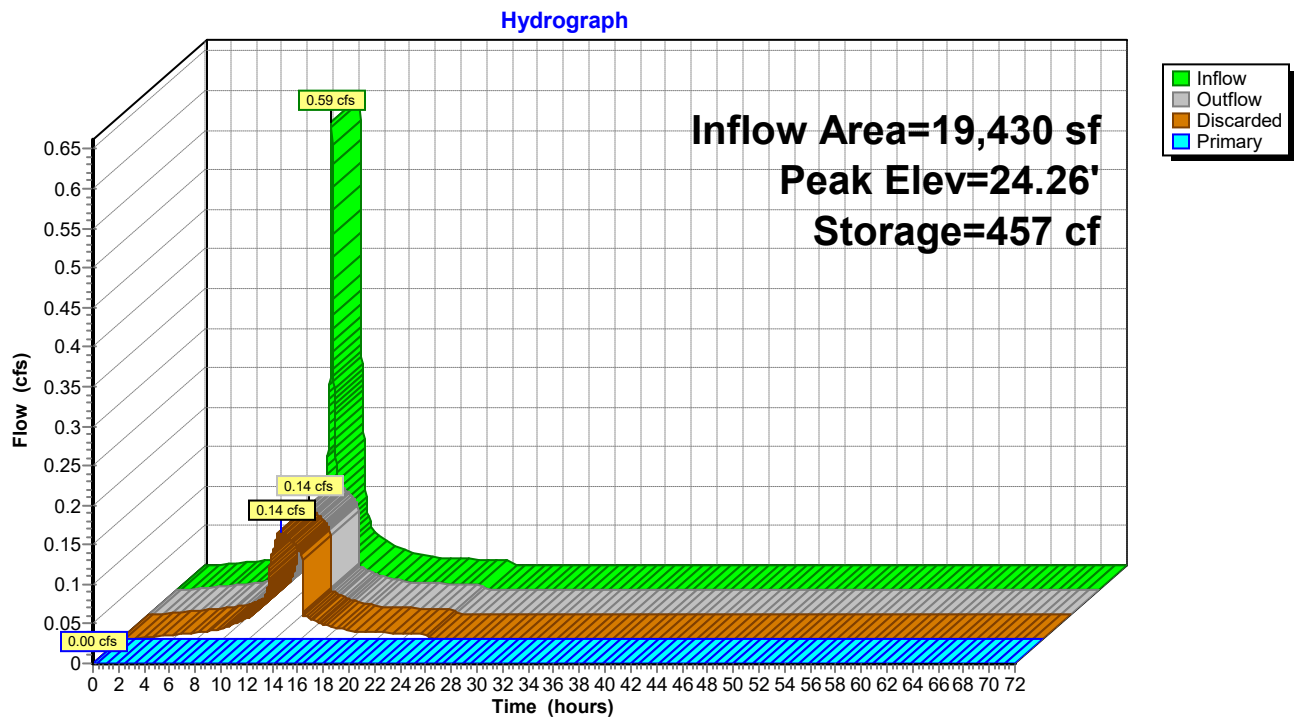
108 Chambers

80.4 cy Field

44.0 cy Stone



Pond IS2: Infiltration System 2



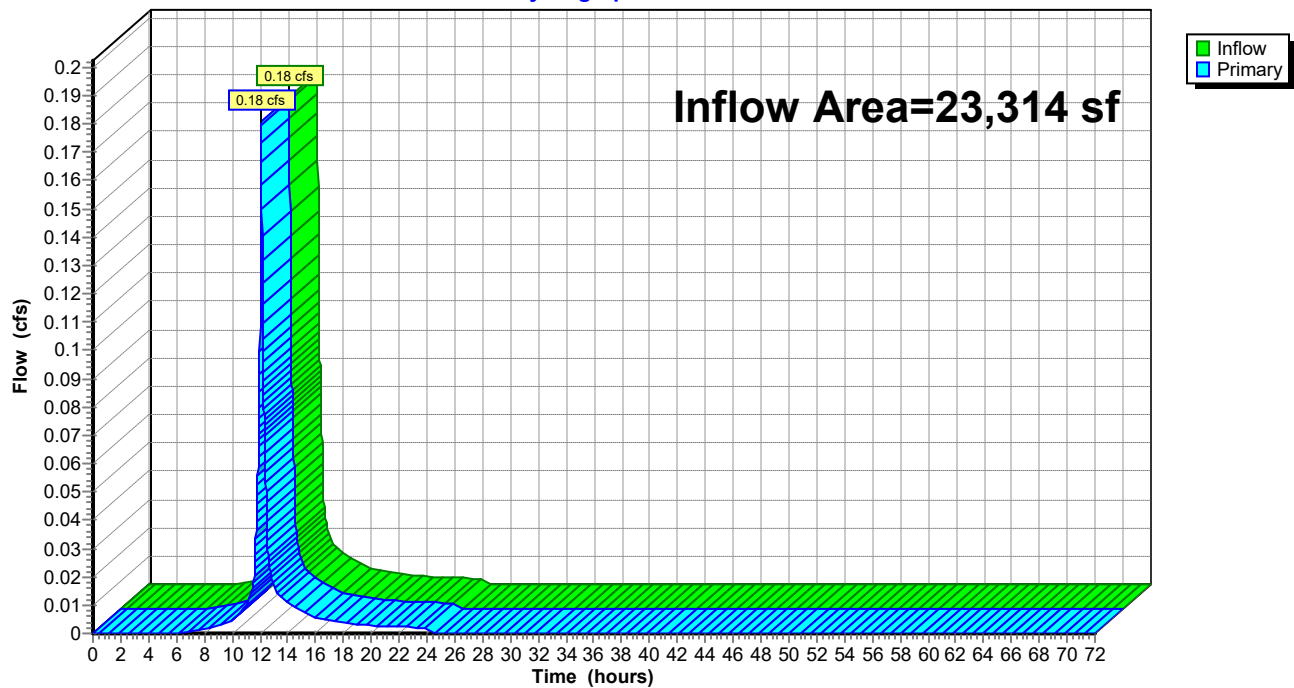
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 23,314 sf, 79.36% Impervious, Inflow Depth = 0.29" for 2-year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 568 cf
Primary = 0.18 cfs @ 12.09 hrs, Volume= 568 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1a: Subcatchment A1a Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=1.04 cfs 3,721 cf

Subcatchment A1b: Subcatchment A1b Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=1.04 cfs 3,721 cf

Subcatchment A2: Subcatchment A2 Runoff Area=940 sf 18.40% Impervious Runoff Depth=1.34"
Tc=6.0 min CN=50 Runoff=0.03 cfs 105 cf

Subcatchment A3a: Subcatchment A3a Runoff Area=3,996 sf 37.94% Impervious Runoff Depth=2.28"
Tc=6.0 min CN=61 Runoff=0.24 cfs 758 cf

Subcatchment A3b: Subcatchment A3b Runoff Area=2,721 sf 85.19% Impervious Runoff Depth=5.12"
Tc=6.0 min CN=89 Runoff=0.36 cfs 1,162 cf

Subcatchment A4: Subcatchment A4 Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=39 Runoff=0.01 cfs 55 cf

Pond IS1: Infiltration System 1 Peak Elev=24.56' Storage=1,666 cf Inflow=1.28 cfs 4,479 cf
Discarded=0.11 cfs 4,479 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 4,479 cf

Pond IS2: Infiltration System 2 Peak Elev=24.83' Storage=684 cf Inflow=1.07 cfs 3,826 cf
Discarded=0.15 cfs 3,209 cf Primary=0.50 cfs 617 cf Outflow=0.65 cfs 3,826 cf

Link A: Ex Drainage System Rindge Ave Inflow=0.76 cfs 1,834 cf
Primary=0.76 cfs 1,834 cf

Total Runoff Area = 23,314 sf Runoff Volume = 9,522 cf Average Runoff Depth = 4.90"
20.64% Pervious = 4,813 sf 79.36% Impervious = 18,501 sf

Summary for Subcatchment A1a: Subcatchment A1a

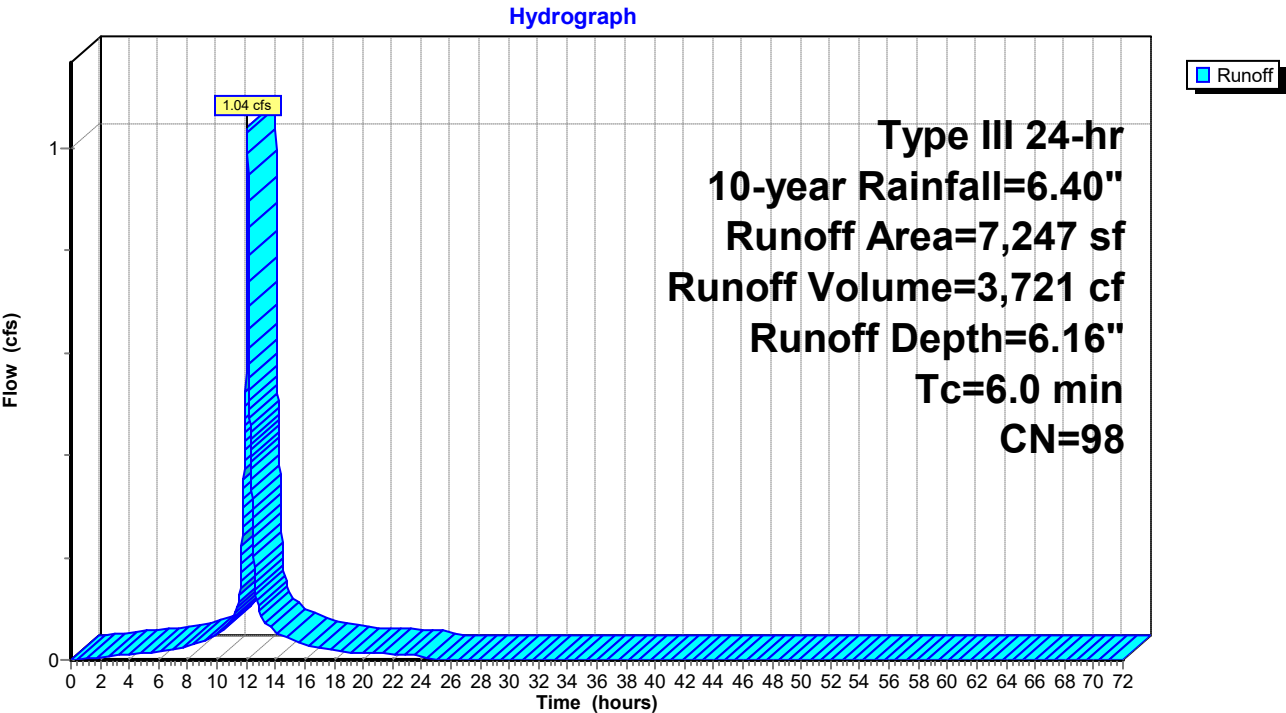
Runoff = 1.04 cfs @ 12.08 hrs, Volume= 3,721 cf, Depth= 6.16"
Routed to Pond IS1 : Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

Area (sf)	CN	Description			
7,247	98	Roofs, HSG A			
7,247		100.00% Impervious Area			

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1a: Subcatchment A1a



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Summary for Subcatchment A1b: Subcatchment A1b

Runoff = 1.04 cfs @ 12.08 hrs, Volume= 3,721 cf, Depth= 6.16"
Routed to Pond IS2 : Infiltration System 2

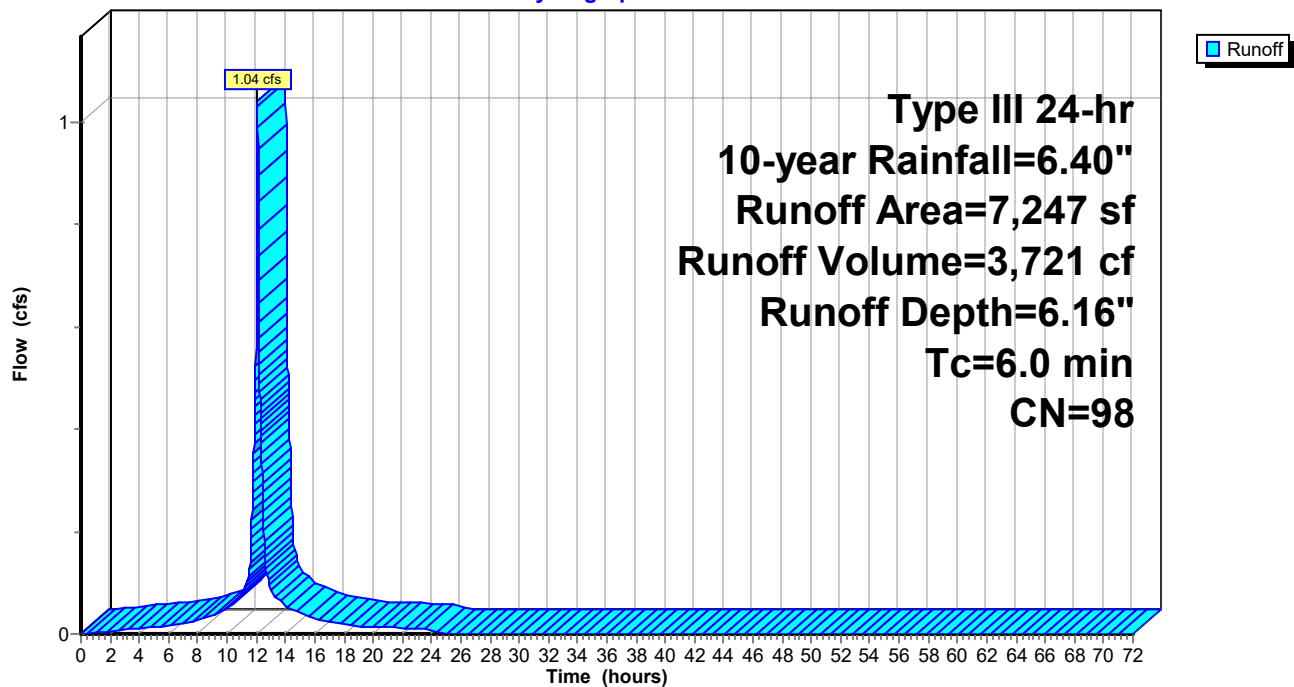
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1b: Subcatchment A1b

Hydrograph



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Summary for Subcatchment A2: Subcatchment A2

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 105 cf, Depth= 1.34"
Routed to Pond IS2 : Infiltration System 2

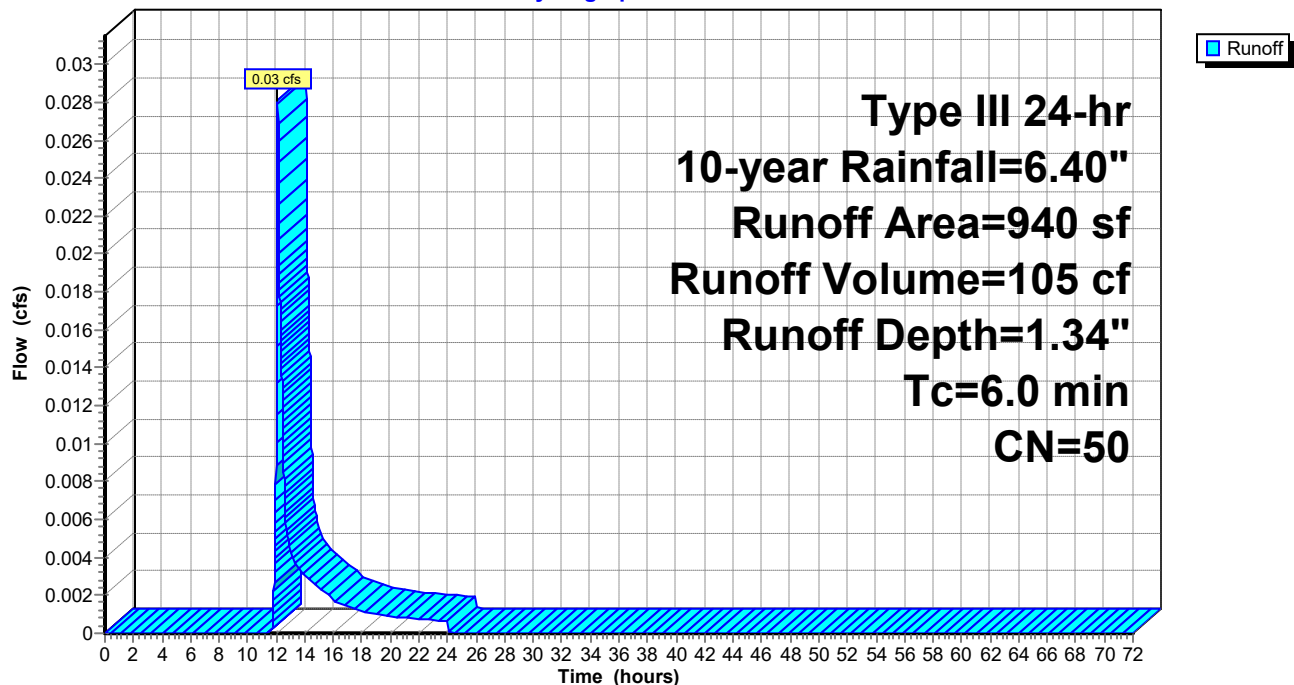
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

	Area (sf)	CN	Description
*	767	39	>75% Grass cover, Good
*	173	98	Paved parking
	940	50	Weighted Average
	767		81.60% Pervious Area
	173		18.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment A3a: Subcatchment A3a

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 758 cf, Depth= 2.28"
Routed to Pond IS1 : Infiltration System 1

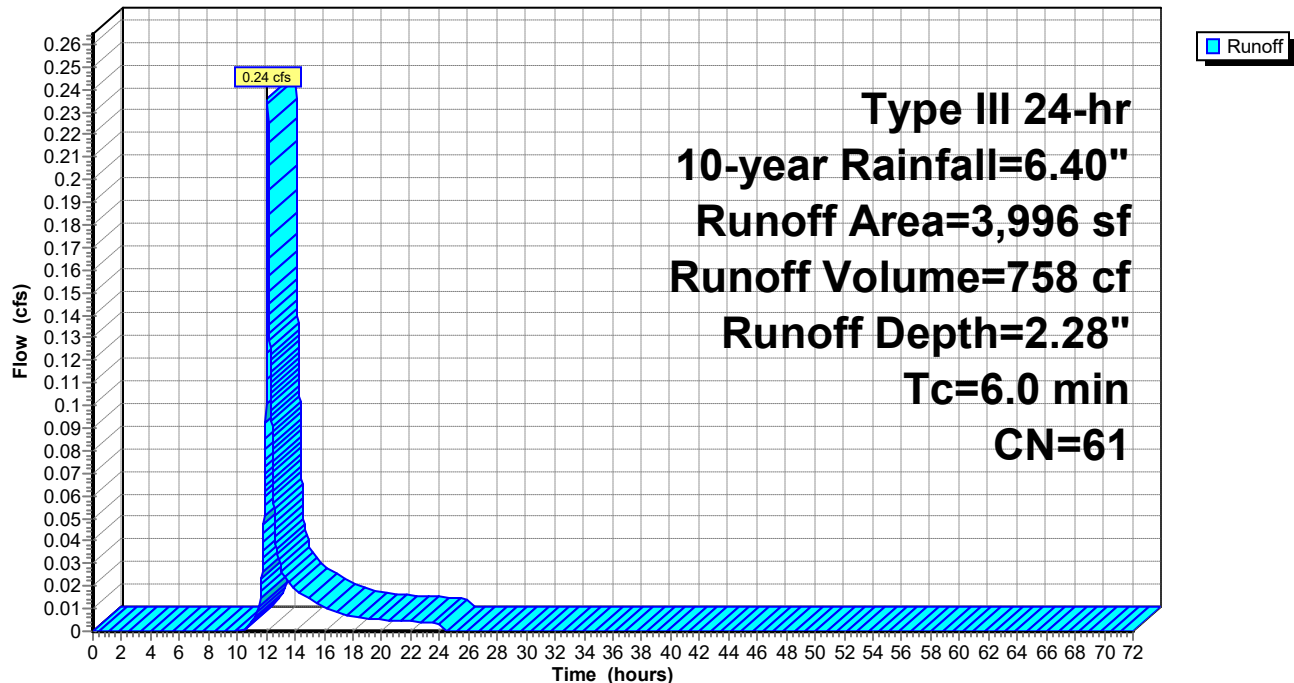
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

Area (sf)	CN	Description
1,516	98	Paved parking, HSG A
2,480	39	>75% Grass cover, Good, HSG A
3,996	61	Weighted Average
2,480		62.06% Pervious Area
1,516		37.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3a: Subcatchment A3a

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment A3b: Subcatchment A3b

Runoff = 0.36 cfs @ 12.08 hrs, Volume= 1,162 cf, Depth= 5.12"
Routed to Link A : Ex Drainage System Rindge Ave

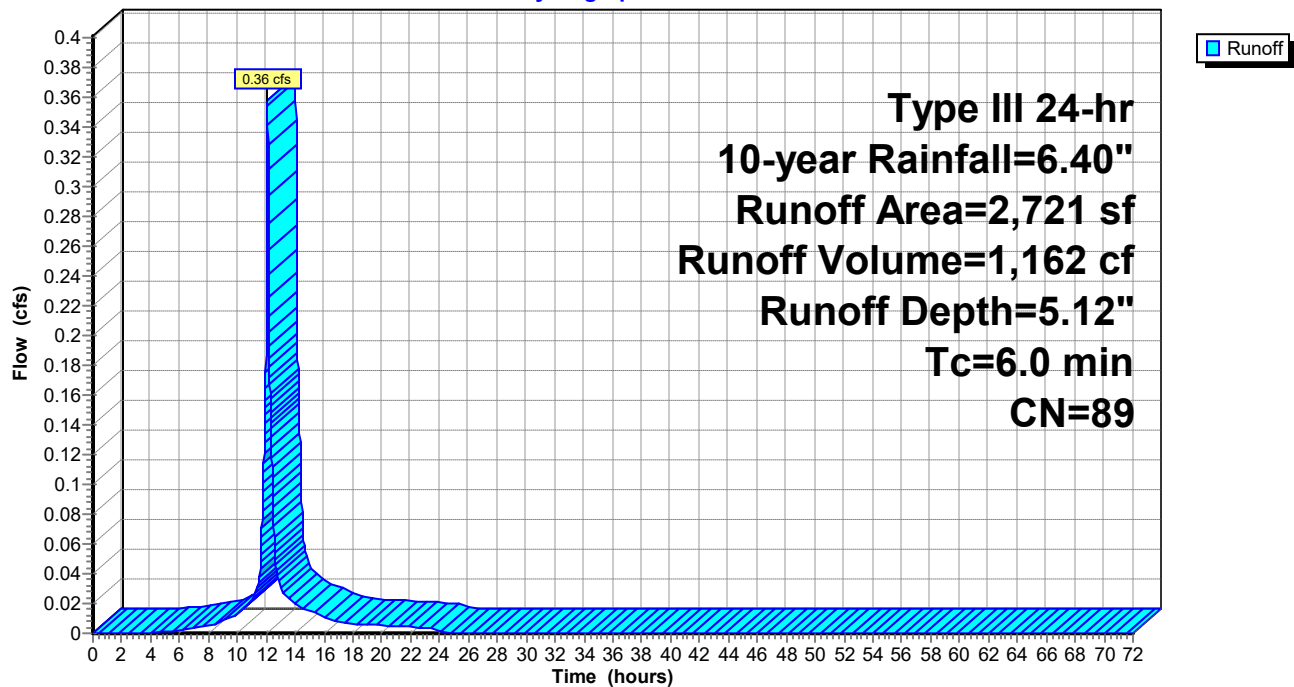
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

Area (sf)	CN	Description
2,318	98	Paved parking, HSG A
403	39	>75% Grass cover, Good, HSG A
2,721	89	Weighted Average
403		14.81% Pervious Area
2,318		85.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3b: Subcatchment A3b

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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Subcatchment A4: Subcatchment A4

Runoff = 0.01 cfs @ 12.30 hrs, Volume= 55 cf, Depth= 0.57"
Routed to Link A : Ex Drainage System Rindge Ave

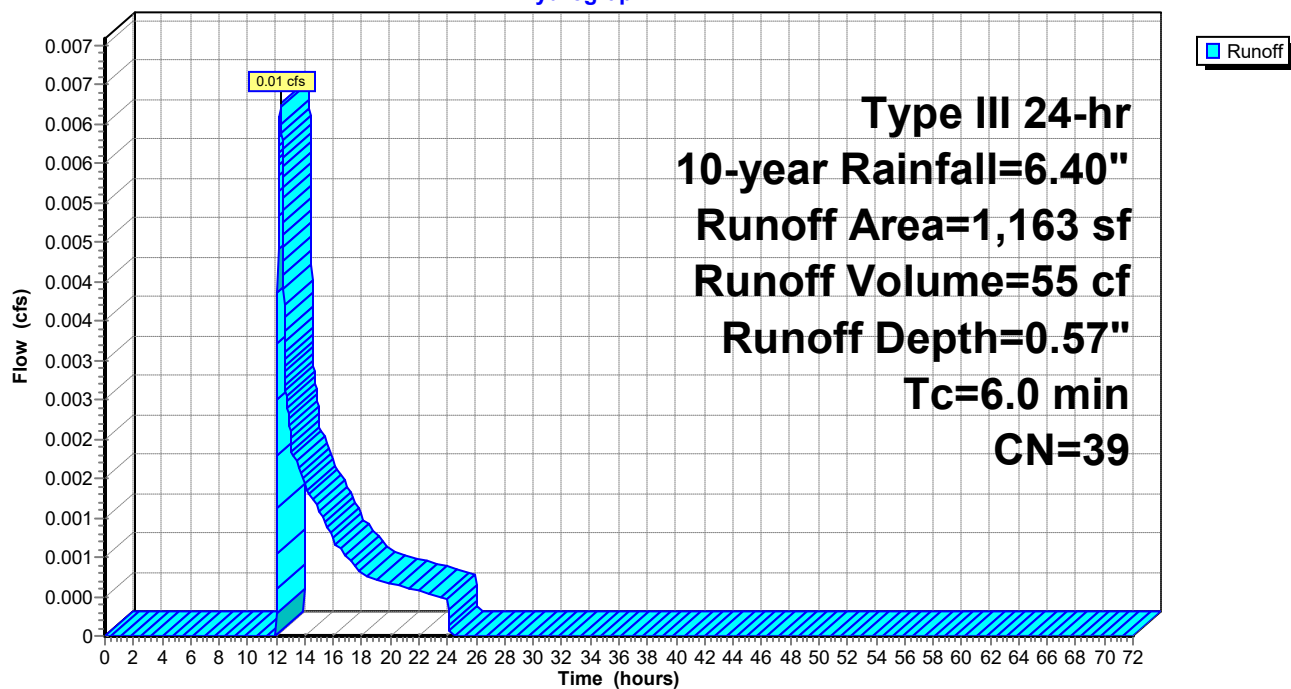
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=6.40"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment A4: Subcatchment A4

Hydrograph



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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Pond IS1: Infiltration System 1

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 4.78" for 10-year event
 Inflow = 1.28 cfs @ 12.09 hrs, Volume= 4,479 cf
 Outflow = 0.11 cfs @ 13.04 hrs, Volume= 4,479 cf, Atten= 91%, Lag= 57.4 min
 Discarded = 0.11 cfs @ 13.04 hrs, Volume= 4,479 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 24.56' @ 13.04 hrs Surf.Area= 1,361 sf Storage= 1,666 cf

Plug-Flow detention time= 123.8 min calculated for 4,479 cf (100% of inflow)
 Center-of-Mass det. time= 123.8 min (886.9 - 763.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.10'	12.0" Round Culvert L= 95.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.10' / 22.15' S= 0.0100 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.05'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.11 cfs @ 13.04 hrs HW=24.56' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.60' TW=22.90' (Dynamic Tailwater)
 ↑ **1=Culvert** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 10-year Rainfall=6.40"

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Pond IS1: Infiltration System 1 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

61 Chambers/Row x 2.35' Long = 143.09' Row Length +24.0" End Stone x 2 = 147.09' Base Length

4 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 9.25' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

244 Chambers x 8.6 cf = 2,107.1 cf Chamber Storage

244 Chambers x 9.1 cf = 2,218.0 cf Displacement

5,377.8 cf Field - 2,218.0 cf Chambers = 3,159.9 cf Stone x 40.0% Voids = 1,263.9 cf Stone Storage

Chamber Storage + Stone Storage = 3,371.0 cf = 0.077 af

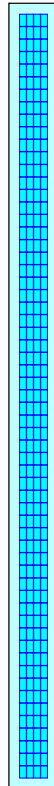
Overall Storage Efficiency = 62.7%

Overall System Size = 147.09' x 9.25' x 3.95'

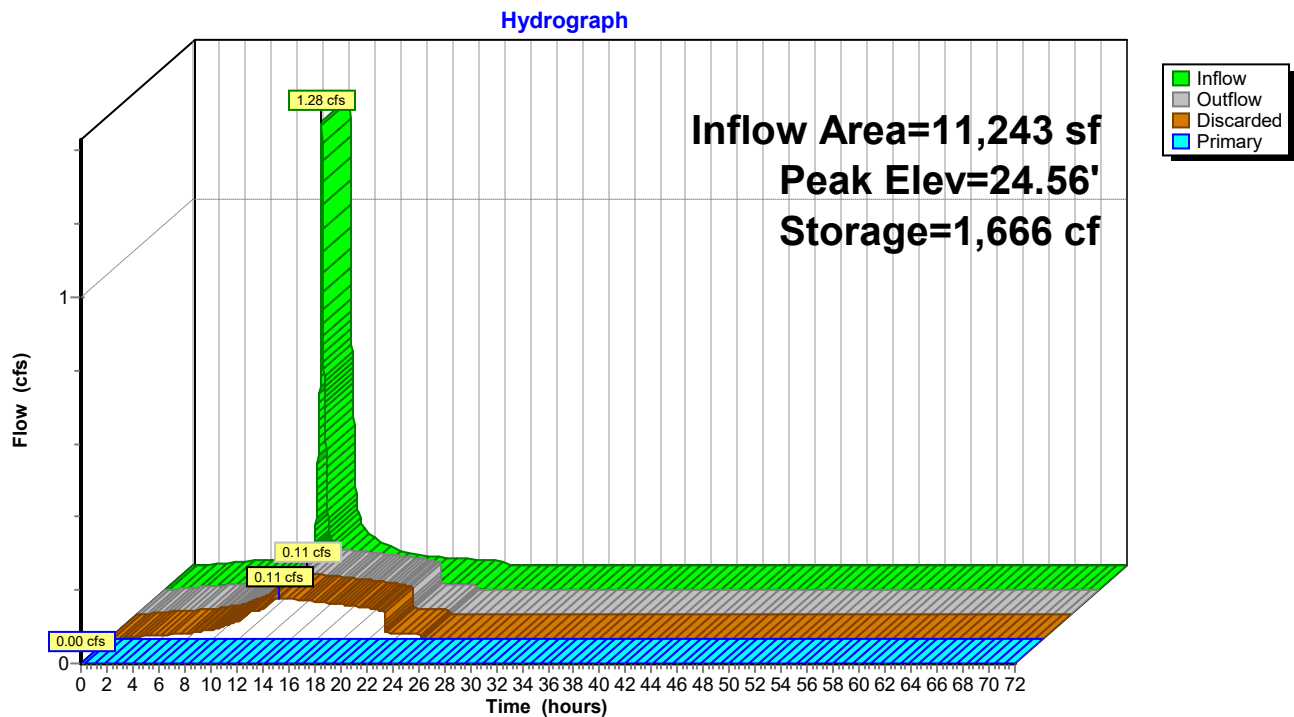
244 Chambers

199.2 cy Field

117.0 cy Stone



Pond IS1: Infiltration System 1



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Type III 24-hr 10-year Rainfall=6.40"

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Summary for Pond IS2: Infiltration System 2

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 2.36" for 10-year event
 Inflow = 1.07 cfs @ 12.08 hrs, Volume= 3,826 cf
 Outflow = 0.65 cfs @ 12.19 hrs, Volume= 3,826 cf, Atten= 40%, Lag= 6.2 min
 Discarded = 0.15 cfs @ 12.19 hrs, Volume= 3,209 cf
 Primary = 0.50 cfs @ 12.19 hrs, Volume= 617 cf
 Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 24.83' @ 12.19 hrs Surf.Area= 549 sf Storage= 684 cf

Plug-Flow detention time= 17.6 min calculated for 3,826 cf (100% of inflow)
 Center-of-Mass det. time= 17.6 min (765.7 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.20'	12.0" Round Culvert L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.20' / 15.00' S= 0.1185 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.90'	8.310 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.30'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.15 cfs @ 12.19 hrs HW=24.83' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.50 cfs @ 12.19 hrs HW=24.83' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.50 cfs of 7.39 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.50 cfs @ 2.53 fps)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 10-year Rainfall=6.40"

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Pond IS2: Infiltration System 2 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

18 Chambers/Row x 2.35' Long = 42.22' Row Length +24.0" End Stone x 2 = 46.22' Base Length

6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

108 Chambers x 8.6 cf = 932.6 cf Chamber Storage

108 Chambers x 9.1 cf = 981.7 cf Displacement

2,169.5 cf Field - 981.7 cf Chambers = 1,187.8 cf Stone x 40.0% Voids = 475.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,407.8 cf = 0.032 af

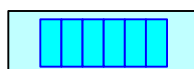
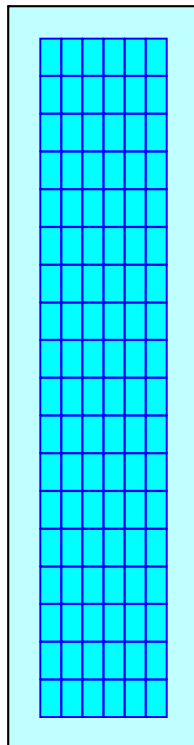
Overall Storage Efficiency = 64.9%

Overall System Size = 46.22' x 11.87' x 3.95'

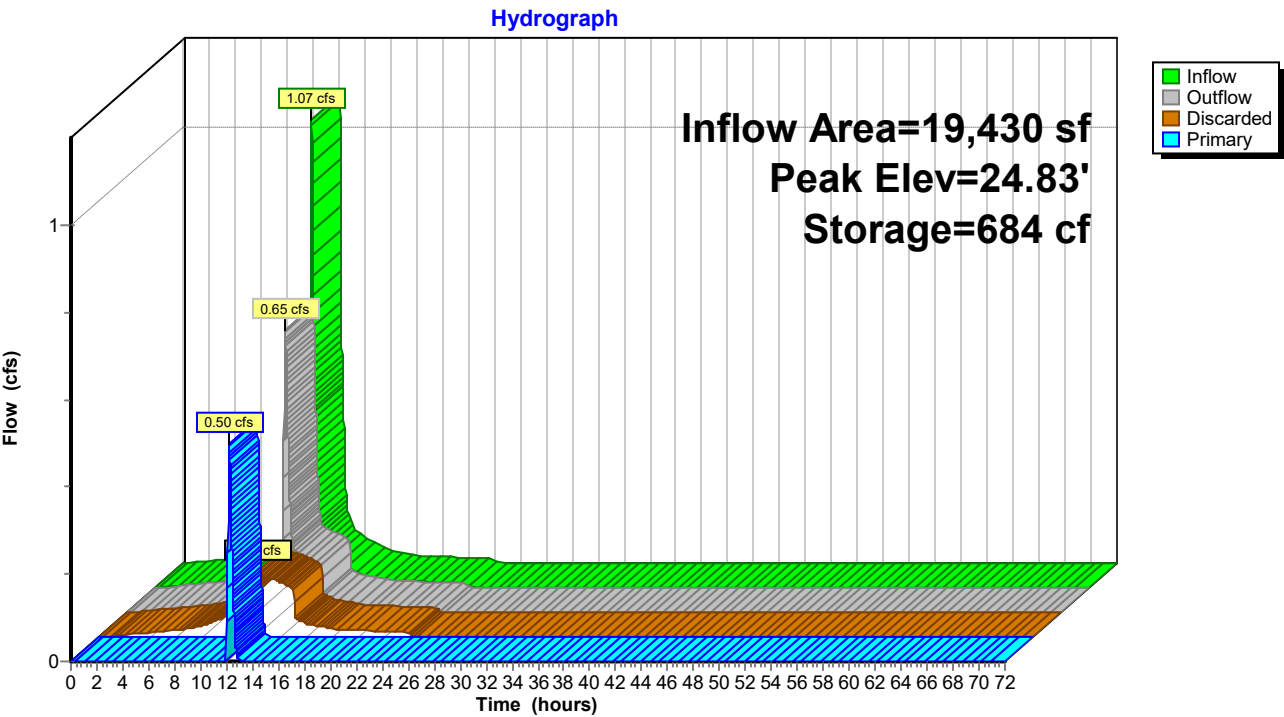
108 Chambers

80.4 cy Field

44.0 cy Stone



Pond IS2: Infiltration System 2



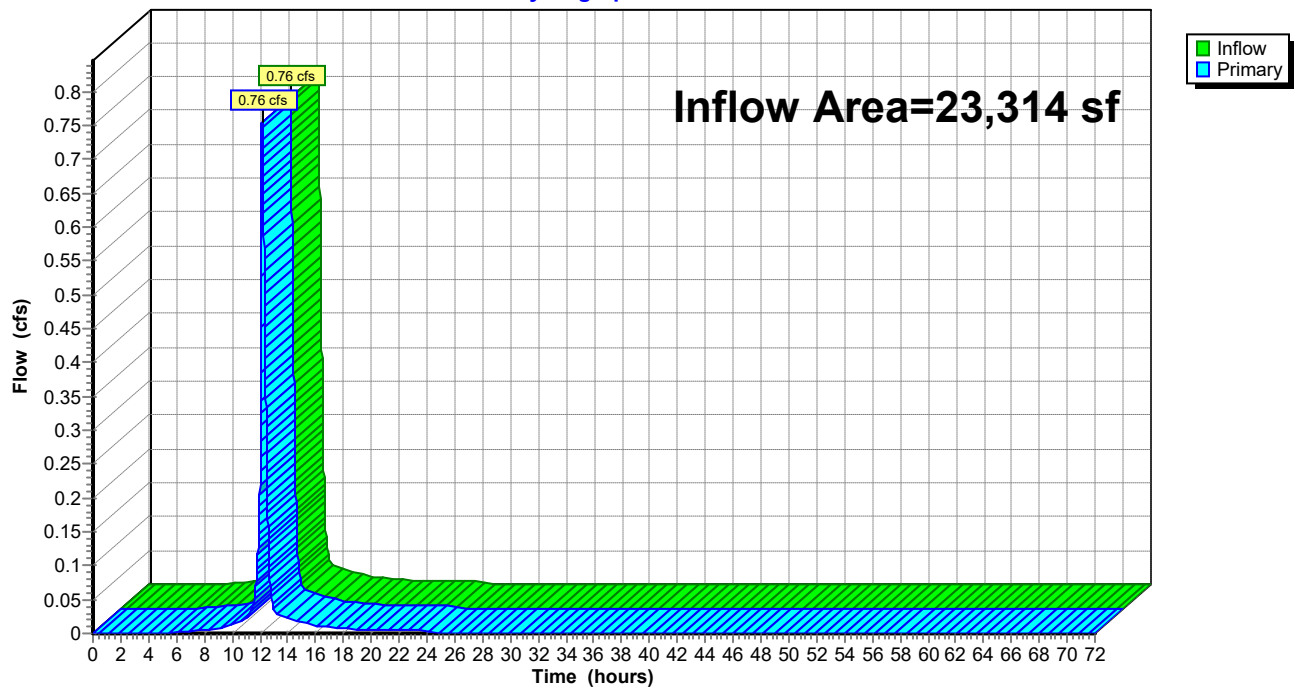
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 23,314 sf, 79.36% Impervious, Inflow Depth = 0.94" for 10-year event
Inflow = 0.76 cfs @ 12.14 hrs, Volume= 1,834 cf
Primary = 0.76 cfs @ 12.14 hrs, Volume= 1,834 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



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Type III 24-hr 25-year Rainfall=8.22"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1a: Subcatchment A1a	Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=7.98" Tc=6.0 min CN=98 Runoff=1.34 cfs 4,819 cf
Subcatchment A1b: Subcatchment A1b	Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=7.98" Tc=6.0 min CN=98 Runoff=1.34 cfs 4,819 cf
Subcatchment A2: Subcatchment A2	Runoff Area=940 sf 18.40% Impervious Runoff Depth=2.39" Tc=6.0 min CN=50 Runoff=0.06 cfs 187 cf
Subcatchment A3a: Subcatchment A3a	Runoff Area=3,996 sf 37.94% Impervious Runoff Depth=3.61" Tc=6.0 min CN=61 Runoff=0.38 cfs 1,203 cf
Subcatchment A3b: Subcatchment A3b	Runoff Area=2,721 sf 85.19% Impervious Runoff Depth=6.90" Tc=6.0 min CN=89 Runoff=0.48 cfs 1,565 cf
Subcatchment A4: Subcatchment A4	Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=1.25" Tc=6.0 min CN=39 Runoff=0.03 cfs 121 cf
Pond IS1: Infiltration System 1	Peak Elev=25.16' Storage=2,246 cf Inflow=1.73 cfs 6,023 cf Discarded=0.12 cfs 5,580 cf Primary=0.18 cfs 442 cf Outflow=0.30 cfs 6,023 cf
Pond IS2: Infiltration System 2	Peak Elev=25.20' Storage=834 cf Inflow=1.40 cfs 5,448 cf Discarded=0.16 cfs 3,969 cf Primary=0.76 cfs 1,480 cf Outflow=0.92 cfs 5,448 cf
Link A: Ex Drainage System Rindge Ave	Inflow=1.17 cfs 3,166 cf Primary=1.17 cfs 3,166 cf

Total Runoff Area = 23,314 sf Runoff Volume = 12,715 cf Average Runoff Depth = 6.54"
20.64% Pervious = 4,813 sf 79.36% Impervious = 18,501 sf

Summary for Subcatchment A1a: Subcatchment A1a

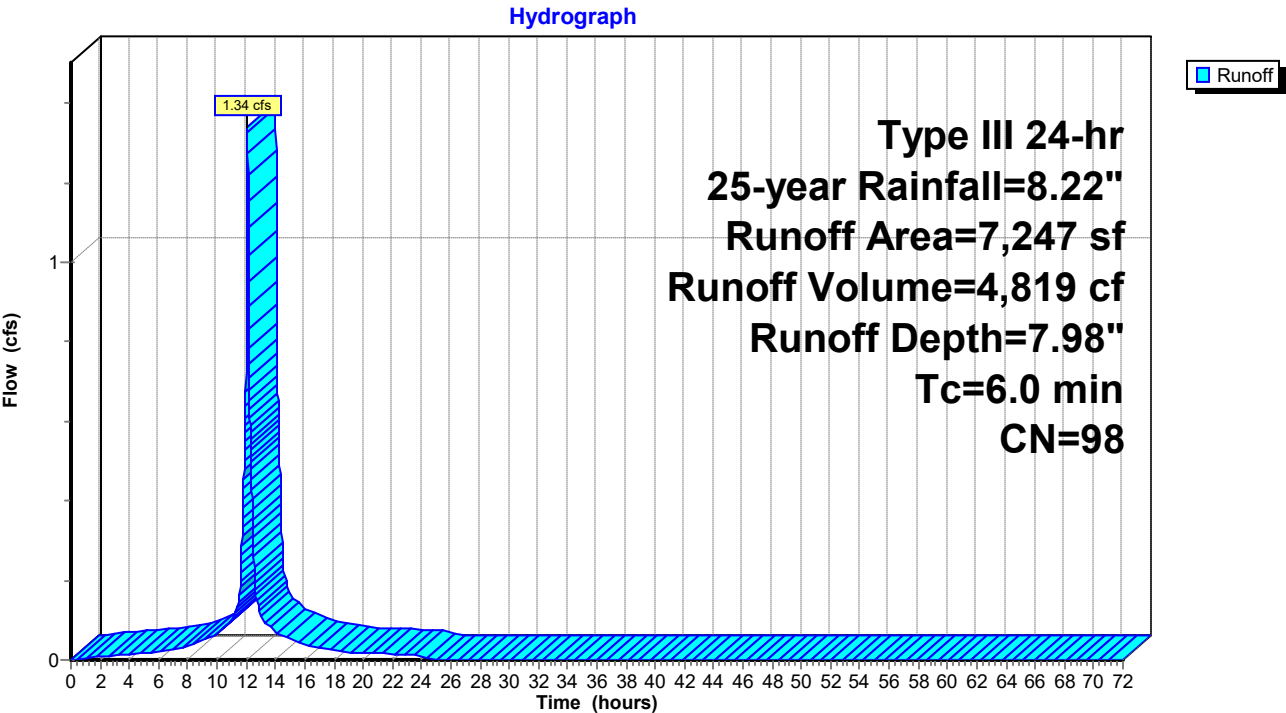
Runoff = 1.34 cfs @ 12.08 hrs, Volume= 4,819 cf, Depth= 7.98"
Routed to Pond IS1 : Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1a: Subcatchment A1a



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Summary for Subcatchment A1b: Subcatchment A1b

Runoff = 1.34 cfs @ 12.08 hrs, Volume= 4,819 cf, Depth= 7.98"
Routed to Pond IS2 : Infiltration System 2

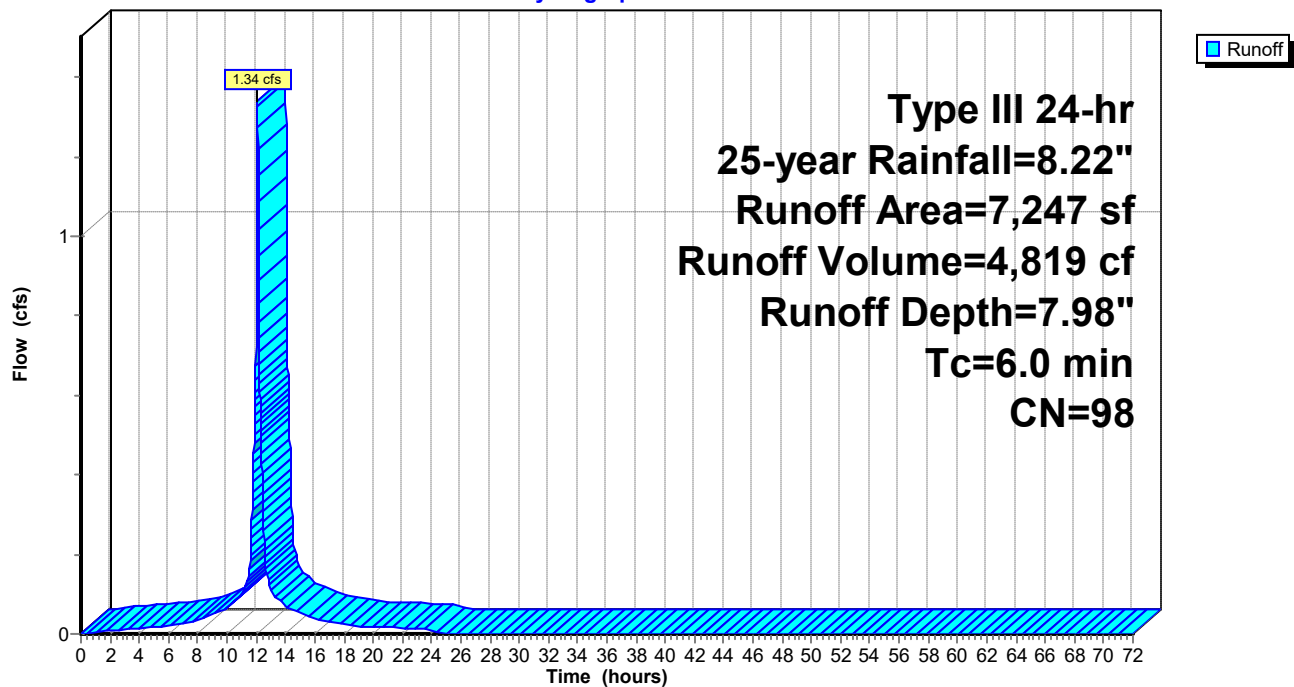
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1b: Subcatchment A1b

Hydrograph



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Summary for Subcatchment A2: Subcatchment A2

Runoff = 0.06 cfs @ 12.10 hrs, Volume= 187 cf, Depth= 2.39"
Routed to Pond IS2 : Infiltration System 2

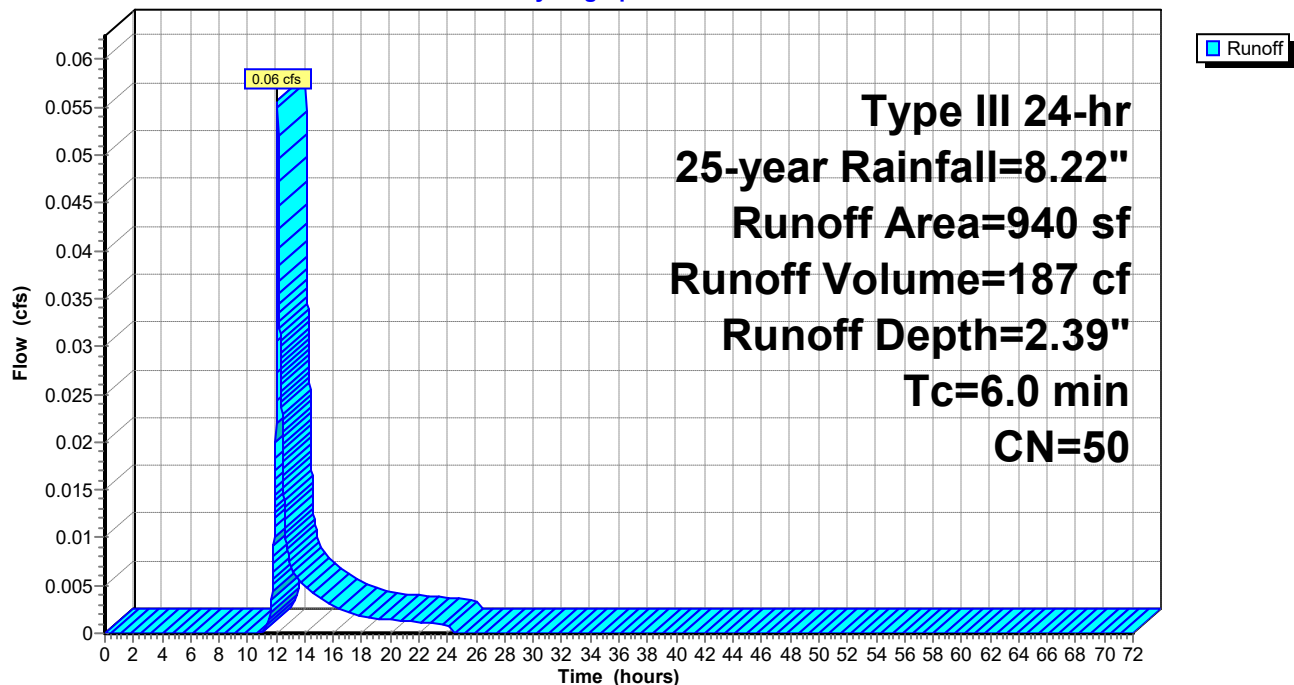
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

	Area (sf)	CN	Description
*	767	39	>75% Grass cover, Good
*	173	98	Paved parking
	940	50	Weighted Average
	767		81.60% Pervious Area
	173		18.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Summary for Subcatchment A3a: Subcatchment A3a

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,203 cf, Depth= 3.61"
Routed to Pond IS1 : Infiltration System 1

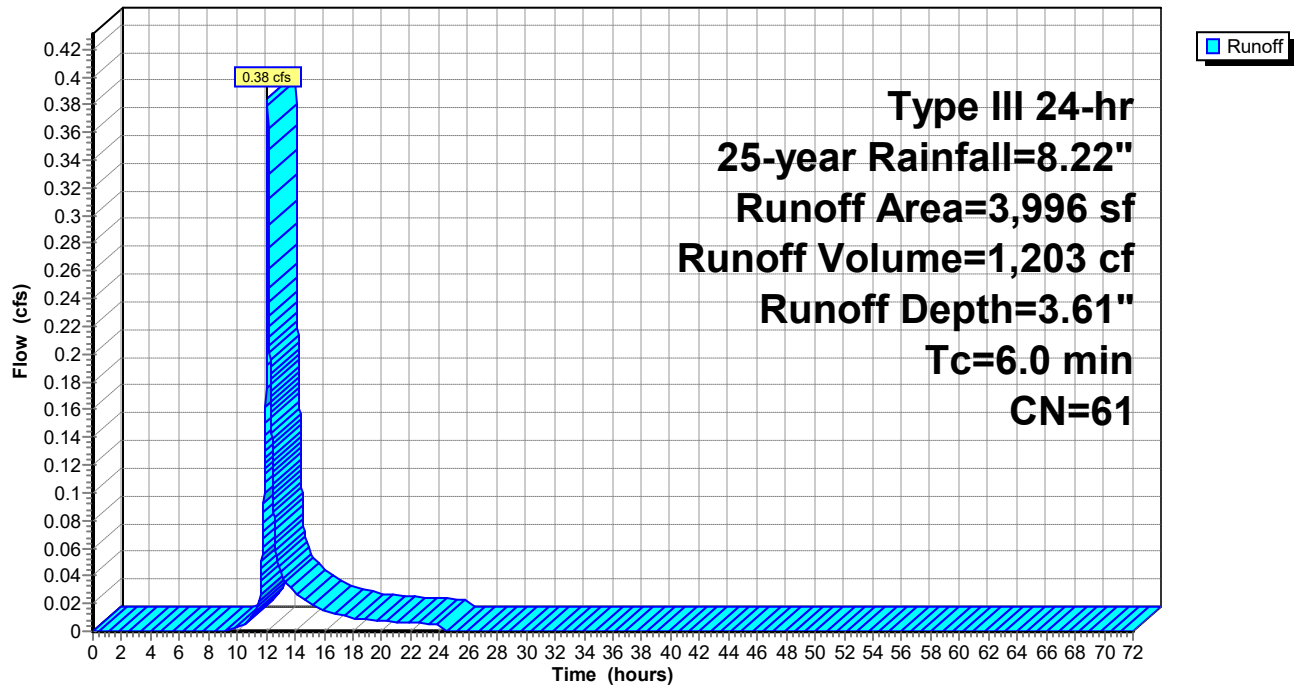
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

Area (sf)	CN	Description
1,516	98	Paved parking, HSG A
2,480	39	>75% Grass cover, Good, HSG A
3,996	61	Weighted Average
2,480		62.06% Pervious Area
1,516		37.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3a: Subcatchment A3a

Hydrograph



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Summary for Subcatchment A3b: Subcatchment A3b

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 1,565 cf, Depth= 6.90"
Routed to Link A : Ex Drainage System Rindge Ave

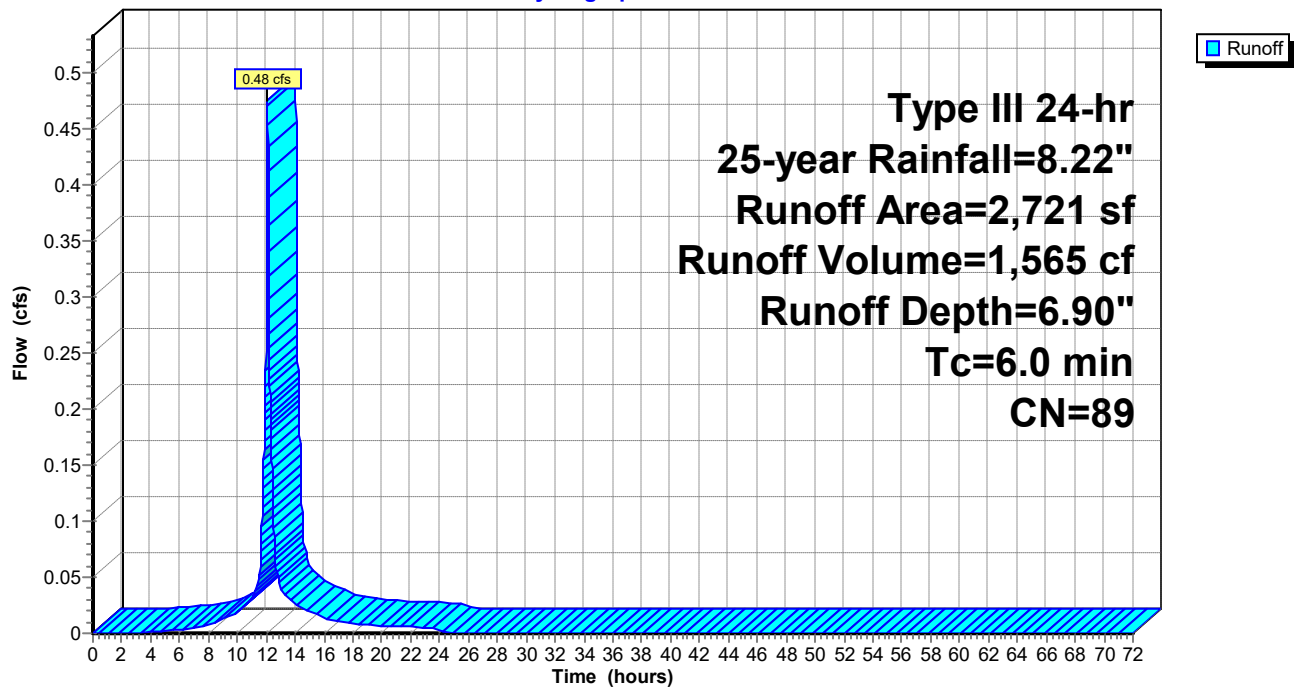
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

Area (sf)	CN	Description
2,318	98	Paved parking, HSG A
403	39	>75% Grass cover, Good, HSG A
2,721	89	Weighted Average
403		14.81% Pervious Area
2,318		85.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3b: Subcatchment A3b

Hydrograph



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Summary for Subcatchment A4: Subcatchment A4

Runoff = 0.03 cfs @ 12.12 hrs, Volume= 121 cf, Depth= 1.25"
Routed to Link A : Ex Drainage System Rindge Ave

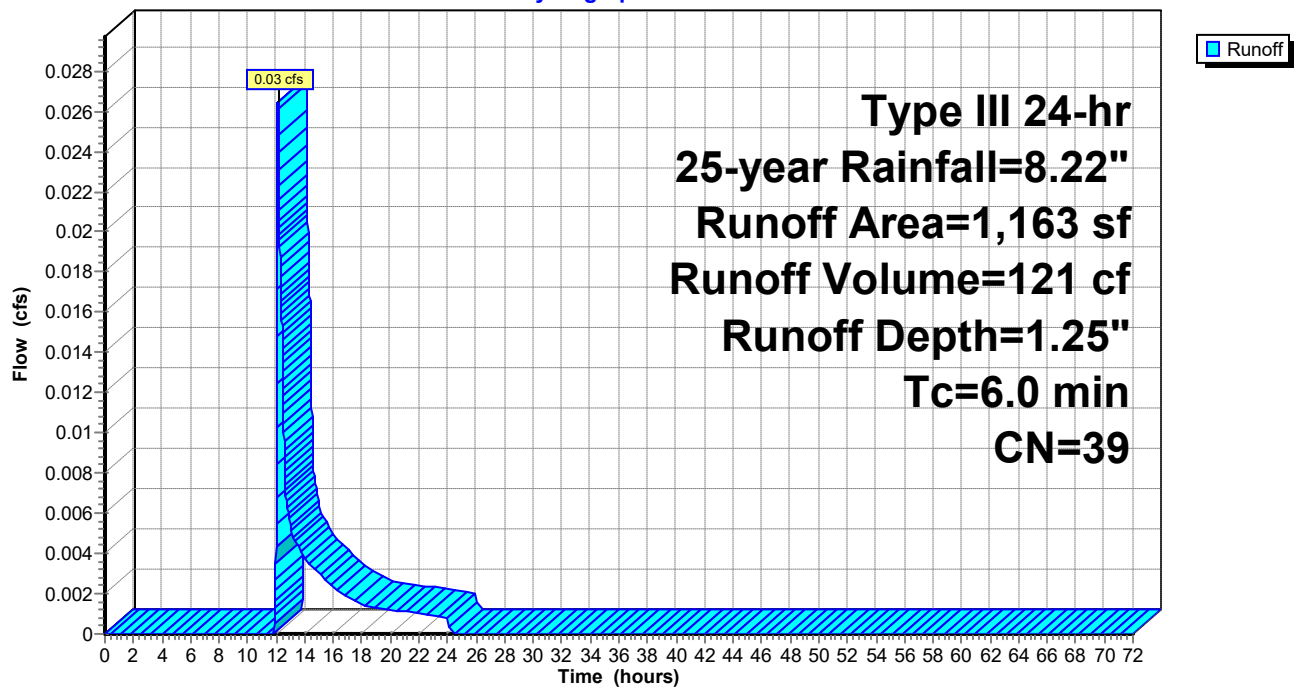
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=8.22"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment A4: Subcatchment A4

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Summary for Pond IS1: Infiltration System 1

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 6.43" for 25-year event
 Inflow = 1.73 cfs @ 12.09 hrs, Volume= 6,023 cf
 Outflow = 0.30 cfs @ 12.55 hrs, Volume= 6,023 cf, Atten= 82%, Lag= 27.6 min
 Discarded = 0.12 cfs @ 12.55 hrs, Volume= 5,580 cf
 Primary = 0.18 cfs @ 12.55 hrs, Volume= 442 cf
 Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 25.16' @ 12.55 hrs Surf.Area= 1,361 sf Storage= 2,246 cf

Plug-Flow detention time= 144.7 min calculated for 6,022 cf (100% of inflow)
 Center-of-Mass det. time= 144.7 min (905.9 - 761.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.10'	12.0" Round Culvert L= 95.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.10' / 22.15' S= 0.0100 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.05'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.12 cfs @ 12.55 hrs HW=25.16' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.18 cfs @ 12.55 hrs HW=25.16' TW=24.70' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.18 cfs of 1.94 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.18 cfs @ 1.74 fps)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 25-year Rainfall=8.22"

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Pond IS1: Infiltration System 1 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

61 Chambers/Row x 2.35' Long = 143.09' Row Length +24.0" End Stone x 2 = 147.09' Base Length

4 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 9.25' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

244 Chambers x 8.6 cf = 2,107.1 cf Chamber Storage

244 Chambers x 9.1 cf = 2,218.0 cf Displacement

5,377.8 cf Field - 2,218.0 cf Chambers = 3,159.9 cf Stone x 40.0% Voids = 1,263.9 cf Stone Storage

Chamber Storage + Stone Storage = 3,371.0 cf = 0.077 af

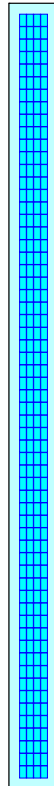
Overall Storage Efficiency = 62.7%

Overall System Size = 147.09' x 9.25' x 3.95'

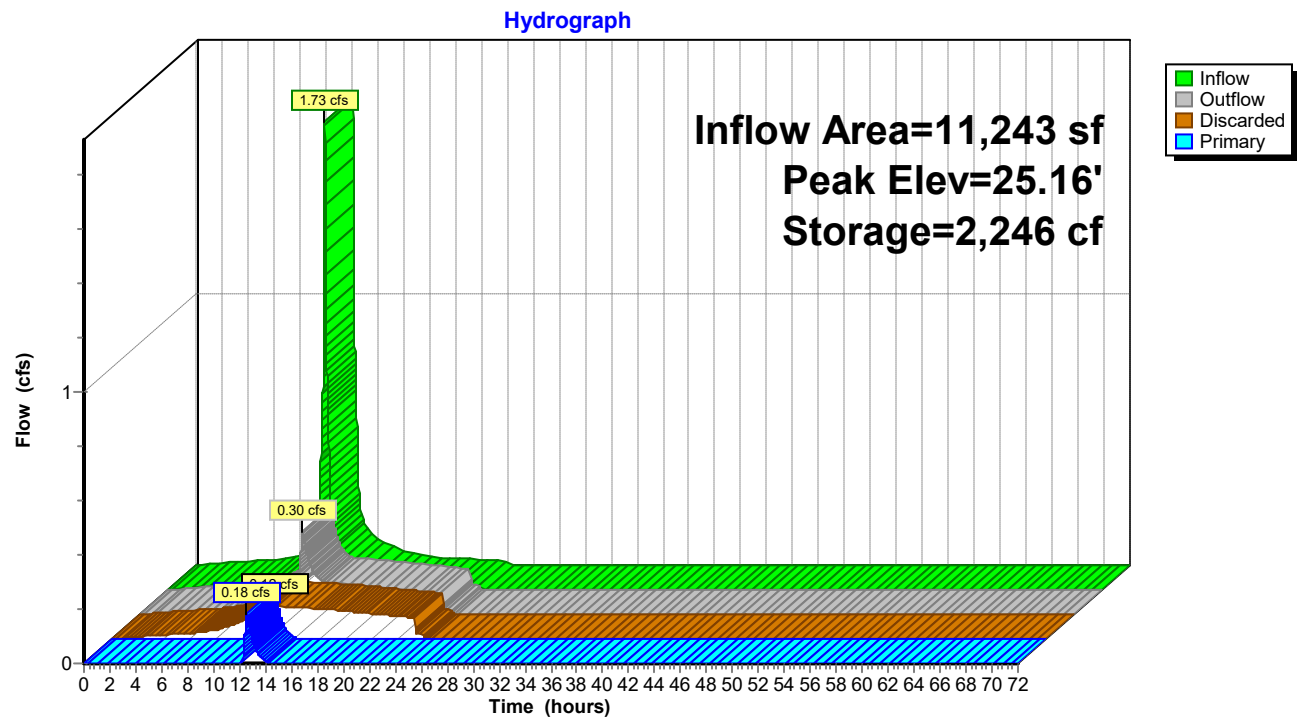
244 Chambers

199.2 cy Field

117.0 cy Stone



Pond IS1: Infiltration System 1



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Type III 24-hr 25-year Rainfall=8.22"

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Summary for Pond IS2: Infiltration System 2

[80] Warning: Exceeded Pond IS1 by 0.85' @ 12.08 hrs (0.00 cfs 108 cf)

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 3.36" for 25-year event
Inflow = 1.40 cfs @ 12.08 hrs, Volume= 5,448 cf
Outflow = 0.92 cfs @ 12.17 hrs, Volume= 5,448 cf, Atten= 34%, Lag= 5.3 min
Discarded = 0.16 cfs @ 12.17 hrs, Volume= 3,969 cf
Primary = 0.76 cfs @ 12.17 hrs, Volume= 1,480 cf

Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 25.20' @ 12.17 hrs Surf.Area= 549 sf Storage= 834 cf

Plug-Flow detention time= 18.4 min calculated for 5,448 cf (100% of inflow)
Center-of-Mass det. time= 18.4 min (766.2 - 747.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.20'	12.0" Round Culvert L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.20' / 15.00' S= 0.1185 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.90'	8.310 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.30'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.16 cfs @ 12.17 hrs HW=25.20' (Free Discharge)
↑ **2=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.76 cfs @ 12.17 hrs HW=25.20' TW=0.00' (Dynamic Tailwater)
↑ **1=Culvert** (Passes 0.76 cfs of 7.61 cfs potential flow)
↑ **3=Orifice/Grate** (Orifice Controls 0.76 cfs @ 3.88 fps)
↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 25-year Rainfall=8.22"

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Pond IS2: Infiltration System 2 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

18 Chambers/Row x 2.35' Long = 42.22' Row Length +24.0" End Stone x 2 = 46.22' Base Length

6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

108 Chambers x 8.6 cf = 932.6 cf Chamber Storage

108 Chambers x 9.1 cf = 981.7 cf Displacement

2,169.5 cf Field - 981.7 cf Chambers = 1,187.8 cf Stone x 40.0% Voids = 475.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,407.8 cf = 0.032 af

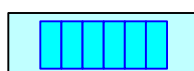
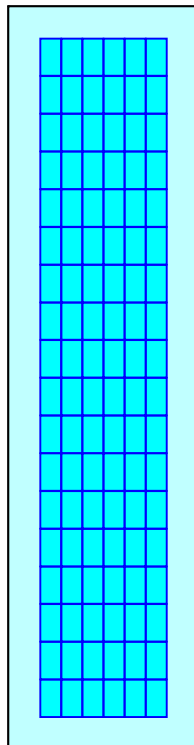
Overall Storage Efficiency = 64.9%

Overall System Size = 46.22' x 11.87' x 3.95'

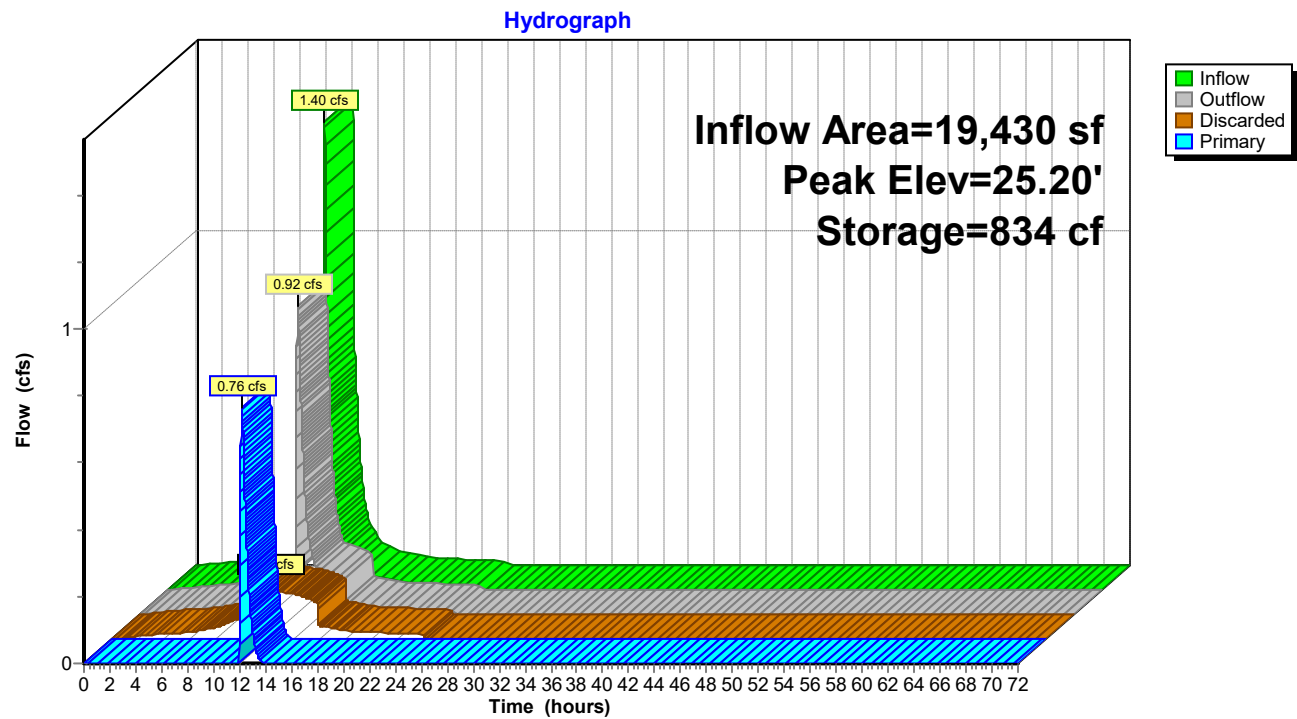
108 Chambers

80.4 cy Field

44.0 cy Stone



Pond IS2: Infiltration System 2



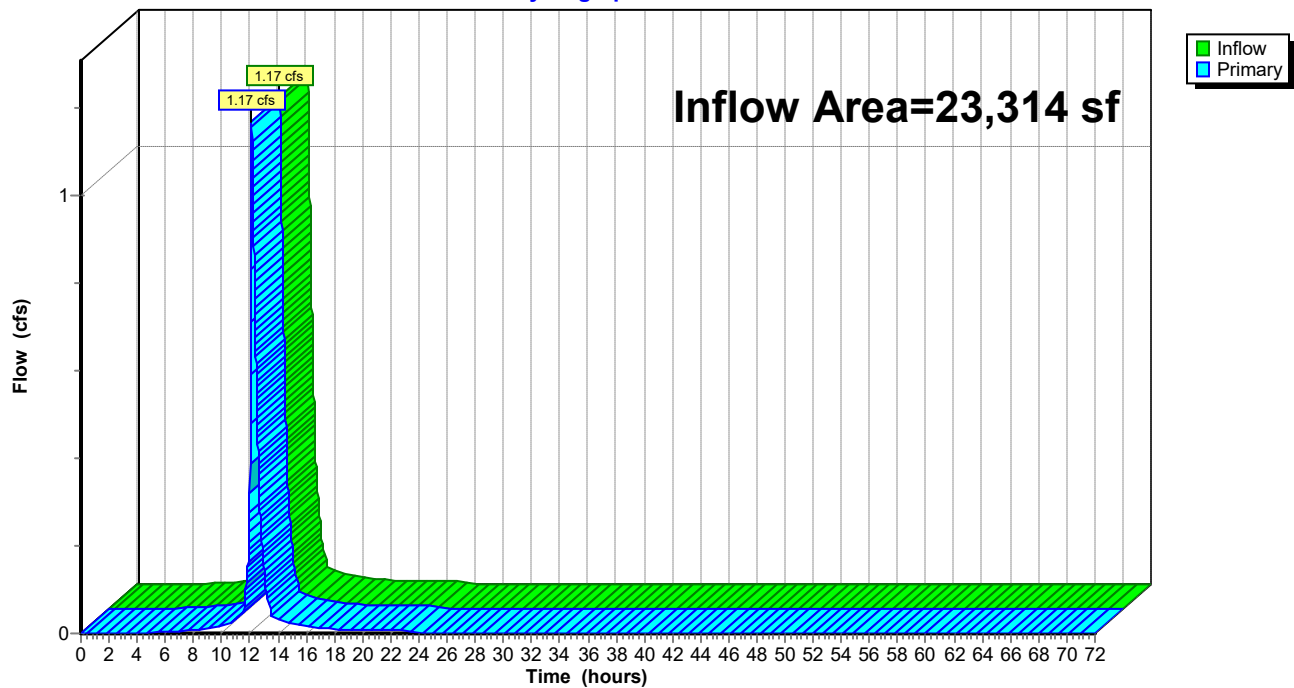
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 23,314 sf, 79.36% Impervious, Inflow Depth = 1.63" for 25-year event
Inflow = 1.17 cfs @ 12.12 hrs, Volume= 3,166 cf
Primary = 1.17 cfs @ 12.12 hrs, Volume= 3,166 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1a: Subcatchment A1a Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=11.46"
Tc=6.0 min CN=98 Runoff=1.91 cfs 6,920 cf

Subcatchment A1b: Subcatchment A1b Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=11.46"
Tc=6.0 min CN=98 Runoff=1.91 cfs 6,920 cf

Subcatchment A2: Subcatchment A2 Runoff Area=940 sf 18.40% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=50 Runoff=0.12 cfs 374 cf

Subcatchment A3a: Subcatchment A3a Runoff Area=3,996 sf 37.94% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=61 Runoff=0.70 cfs 2,151 cf

Subcatchment A3b: Subcatchment A3b Runoff Area=2,721 sf 85.19% Impervious Runoff Depth=10.34"
Tc=6.0 min CN=89 Runoff=0.70 cfs 2,344 cf

Subcatchment A4: Subcatchment A4 Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=3.03"
Tc=6.0 min CN=39 Runoff=0.09 cfs 294 cf

Pond IS1: Infiltration System 1 Peak Elev=26.24' Storage=3,201 cf Inflow=2.61 cfs 9,071 cf
Discarded=0.14 cfs 6,676 cf Primary=0.87 cfs 2,395 cf Outflow=1.00 cfs 9,071 cf

Pond IS2: Infiltration System 2 Peak Elev=26.17' Storage=1,226 cf Inflow=2.03 cfs 9,689 cf
Discarded=0.18 cfs 5,193 cf Primary=1.21 cfs 4,496 cf Outflow=1.38 cfs 9,689 cf

Link A: Ex Drainage System Rindge Ave Inflow=1.78 cfs 7,134 cf
Primary=1.78 cfs 7,134 cf

Total Runoff Area = 23,314 sf Runoff Volume = 19,003 cf Average Runoff Depth = 9.78"
20.64% Pervious = 4,813 sf 79.36% Impervious = 18,501 sf

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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A1a: Subcatchment A1a

Runoff = 1.91 cfs @ 12.08 hrs, Volume= 6,920 cf, Depth=11.46"
Routed to Pond IS1 : Infiltration System 1

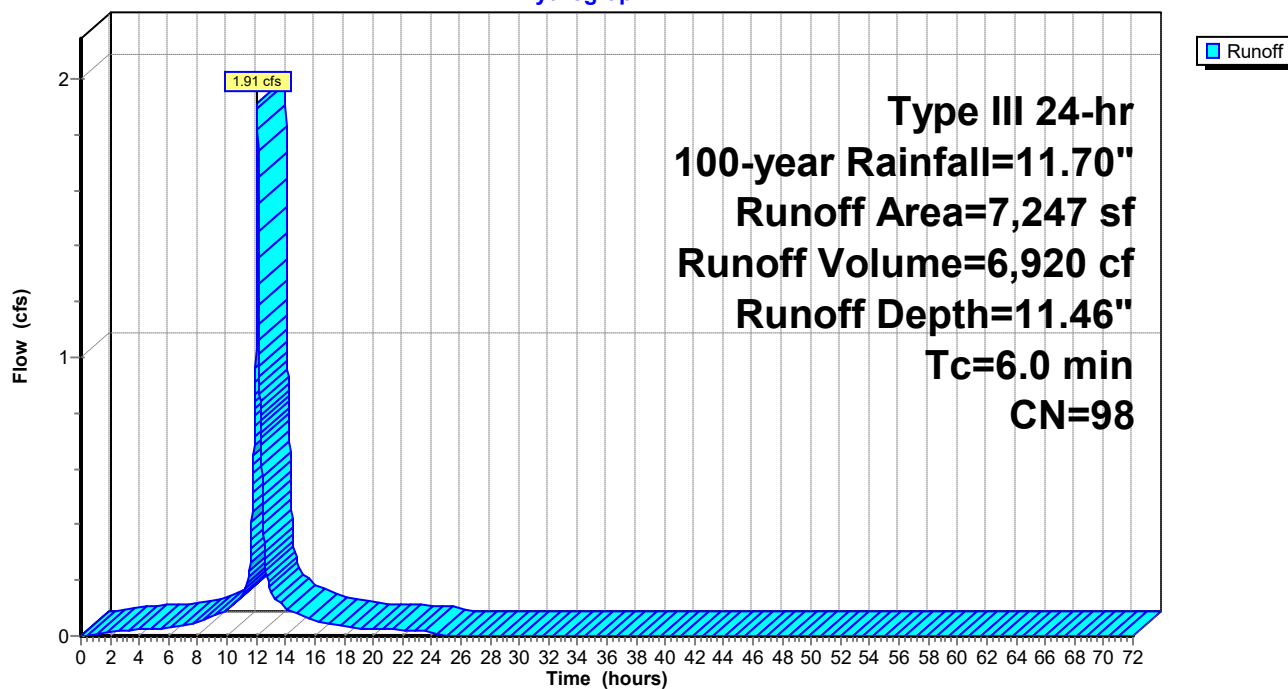
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1a: Subcatchment A1a

Hydrograph



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Summary for Subcatchment A1b: Subcatchment A1b

Runoff = 1.91 cfs @ 12.08 hrs, Volume= 6,920 cf, Depth=11.46"
Routed to Pond IS2 : Infiltration System 2

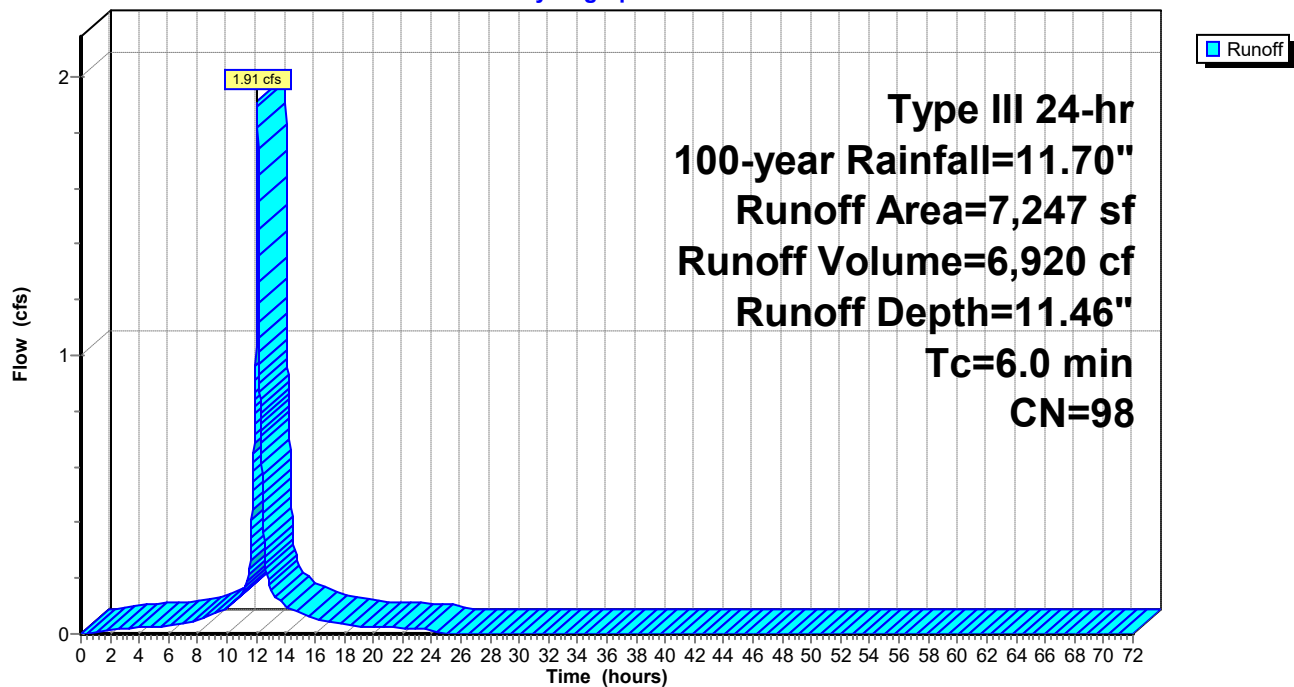
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1b: Subcatchment A1b

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A2: Subcatchment A2

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 374 cf, Depth= 4.78"
Routed to Pond IS2 : Infiltration System 2

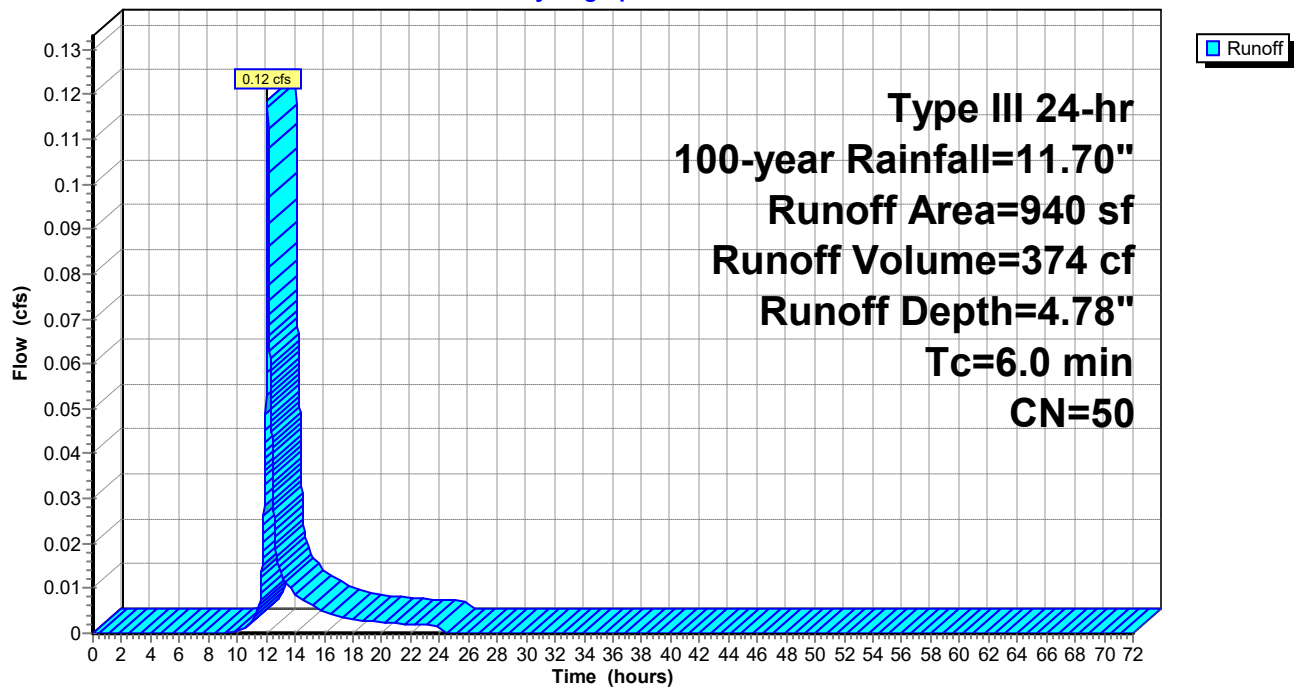
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

	Area (sf)	CN	Description
*	767	39	>75% Grass cover, Good
*	173	98	Paved parking
	940	50	Weighted Average
	767		81.60% Pervious Area
	173		18.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A3a: Subcatchment A3a

Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,151 cf, Depth= 6.46"
Routed to Pond IS1 : Infiltration System 1

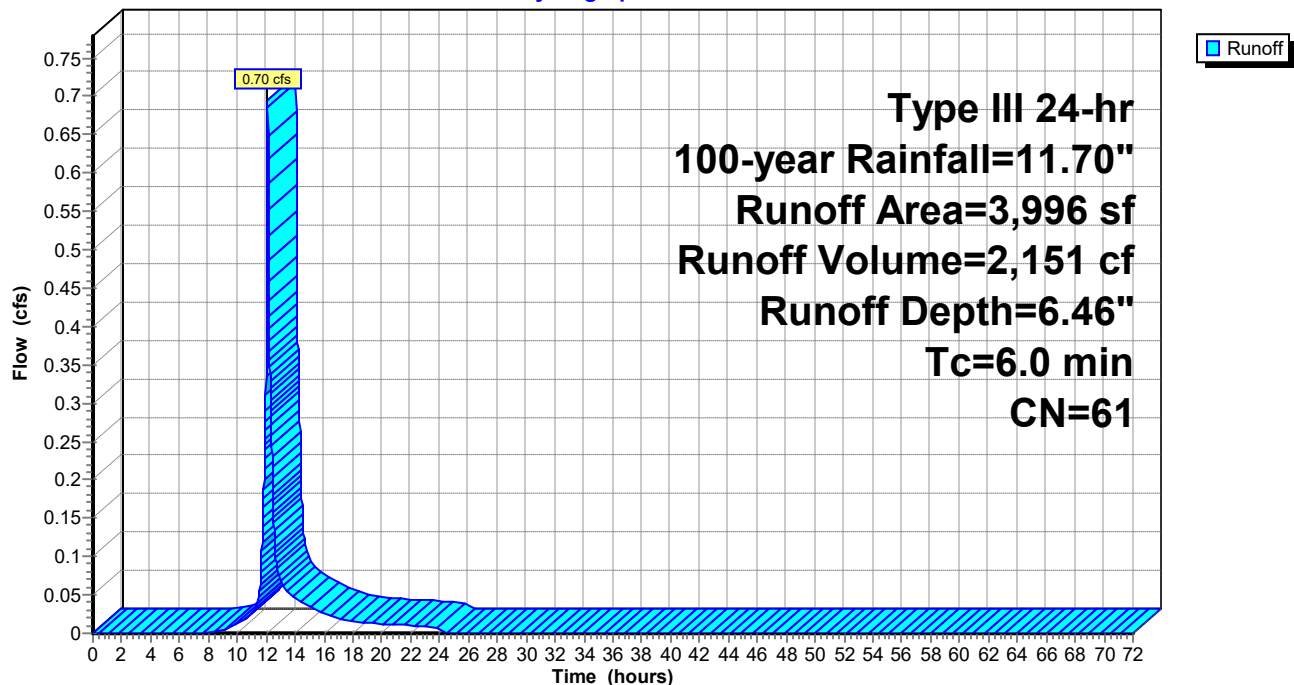
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

Area (sf)	CN	Description
1,516	98	Paved parking, HSG A
2,480	39	>75% Grass cover, Good, HSG A
3,996	61	Weighted Average
2,480		62.06% Pervious Area
1,516		37.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3a: Subcatchment A3a

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A3b: Subcatchment A3b

Runoff = 0.70 cfs @ 12.08 hrs, Volume= 2,344 cf, Depth=10.34"
Routed to Link A : Ex Drainage System Rindge Ave

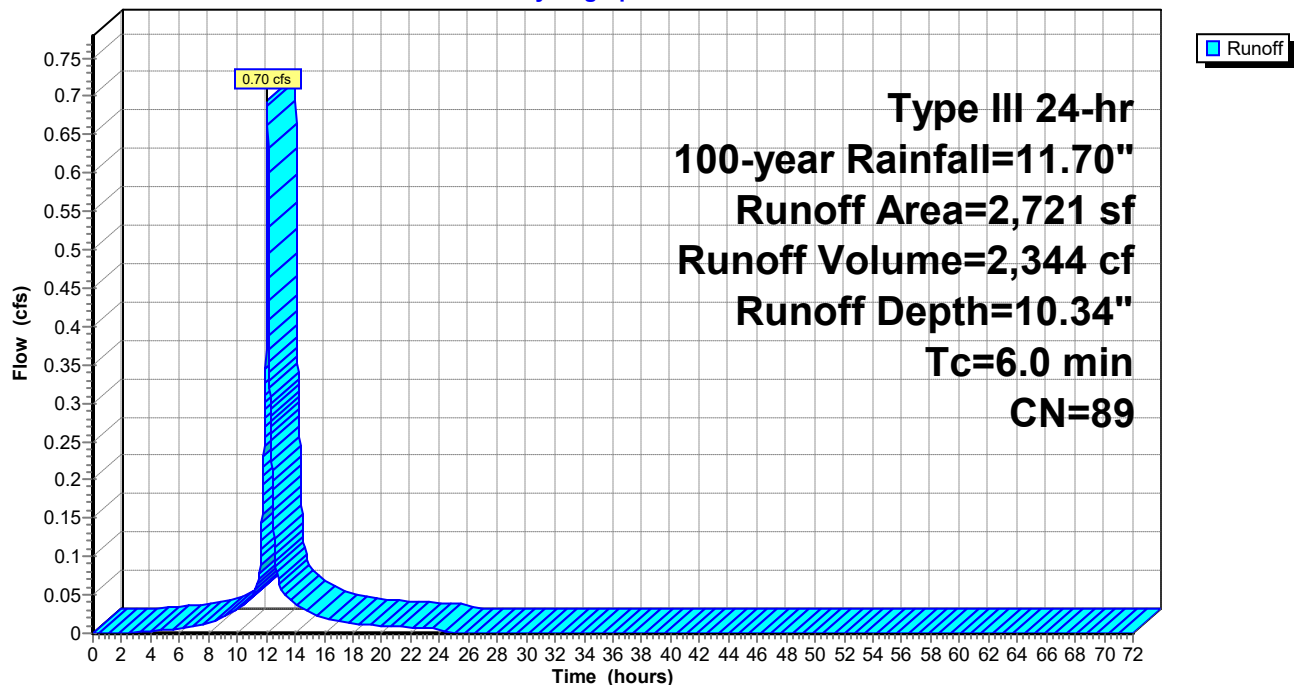
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

Area (sf)	CN	Description
2,318	98	Paved parking, HSG A
403	39	>75% Grass cover, Good, HSG A
2,721	89	Weighted Average
403		14.81% Pervious Area
2,318		85.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3b: Subcatchment A3b

Hydrograph



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Subcatchment A4: Subcatchment A4

Runoff = 0.09 cfs @ 12.10 hrs, Volume= 294 cf, Depth= 3.03"
Routed to Link A : Ex Drainage System Rindge Ave

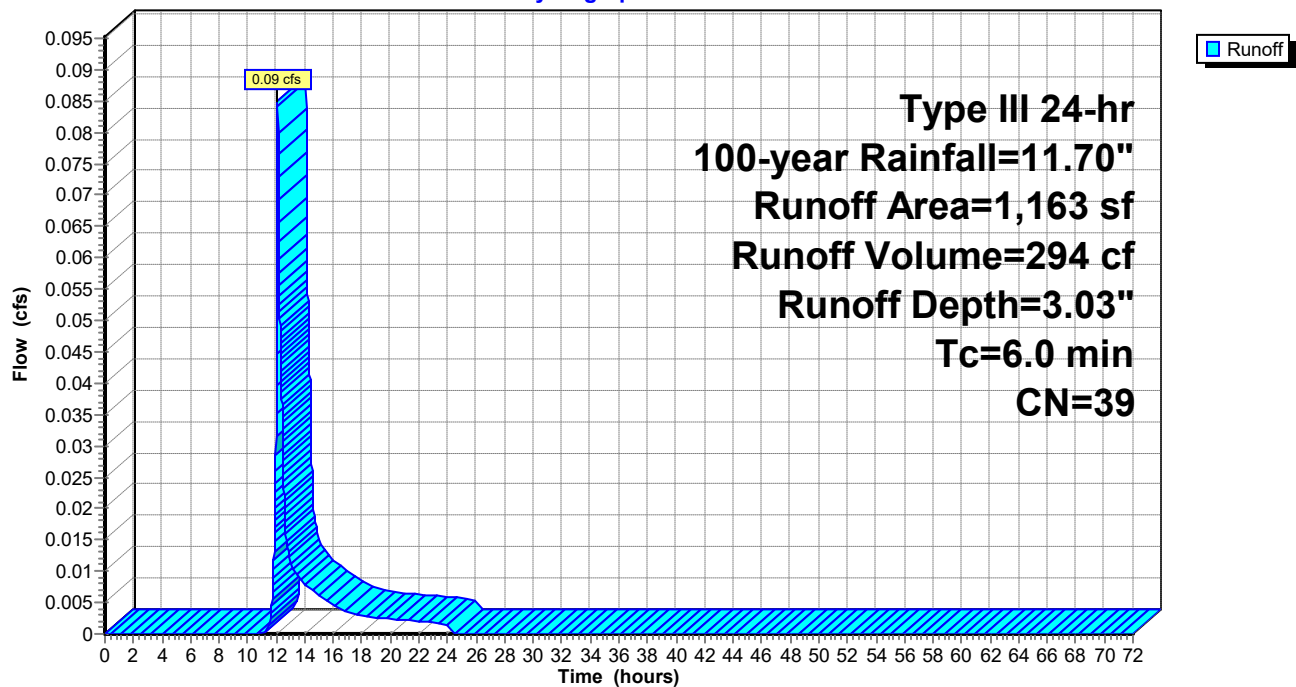
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=11.70"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment A4: Subcatchment A4

Hydrograph



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Summary for Pond IS1: Infiltration System 1

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 9.68" for 100-year event
 Inflow = 2.61 cfs @ 12.08 hrs, Volume= 9,071 cf
 Outflow = 1.00 cfs @ 12.28 hrs, Volume= 9,071 cf, Atten= 62%, Lag= 11.4 min
 Discarded = 0.14 cfs @ 12.37 hrs, Volume= 6,676 cf
 Primary = 0.87 cfs @ 12.28 hrs, Volume= 2,395 cf
 Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 26.24' @ 12.37 hrs Surf.Area= 1,361 sf Storage= 3,201 cf

Plug-Flow detention time= 126.6 min calculated for 9,071 cf (100% of inflow)
 Center-of-Mass det. time= 126.6 min (884.7 - 758.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.10'	12.0" Round Culvert L= 95.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.10' / 22.15' S= 0.0100 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.05'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.14 cfs @ 12.37 hrs HW=26.24' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.87 cfs @ 12.28 hrs HW=26.17' TW=26.06' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.87 cfs of 0.97 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 1.63 fps)
 ↑ **4=Sharp-Crested Rectangular Weir** (Weir Controls 0.55 cfs @ 1.13 fps)

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Type III 24-hr 100-year Rainfall=11.70"

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Pond IS1: Infiltration System 1 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

61 Chambers/Row x 2.35' Long = 143.09' Row Length +24.0" End Stone x 2 = 147.09' Base Length

4 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 9.25' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

244 Chambers x 8.6 cf = 2,107.1 cf Chamber Storage

244 Chambers x 9.1 cf = 2,218.0 cf Displacement

5,377.8 cf Field - 2,218.0 cf Chambers = 3,159.9 cf Stone x 40.0% Voids = 1,263.9 cf Stone Storage

Chamber Storage + Stone Storage = 3,371.0 cf = 0.077 af

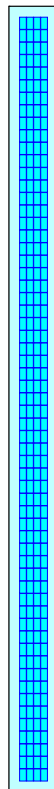
Overall Storage Efficiency = 62.7%

Overall System Size = 147.09' x 9.25' x 3.95'

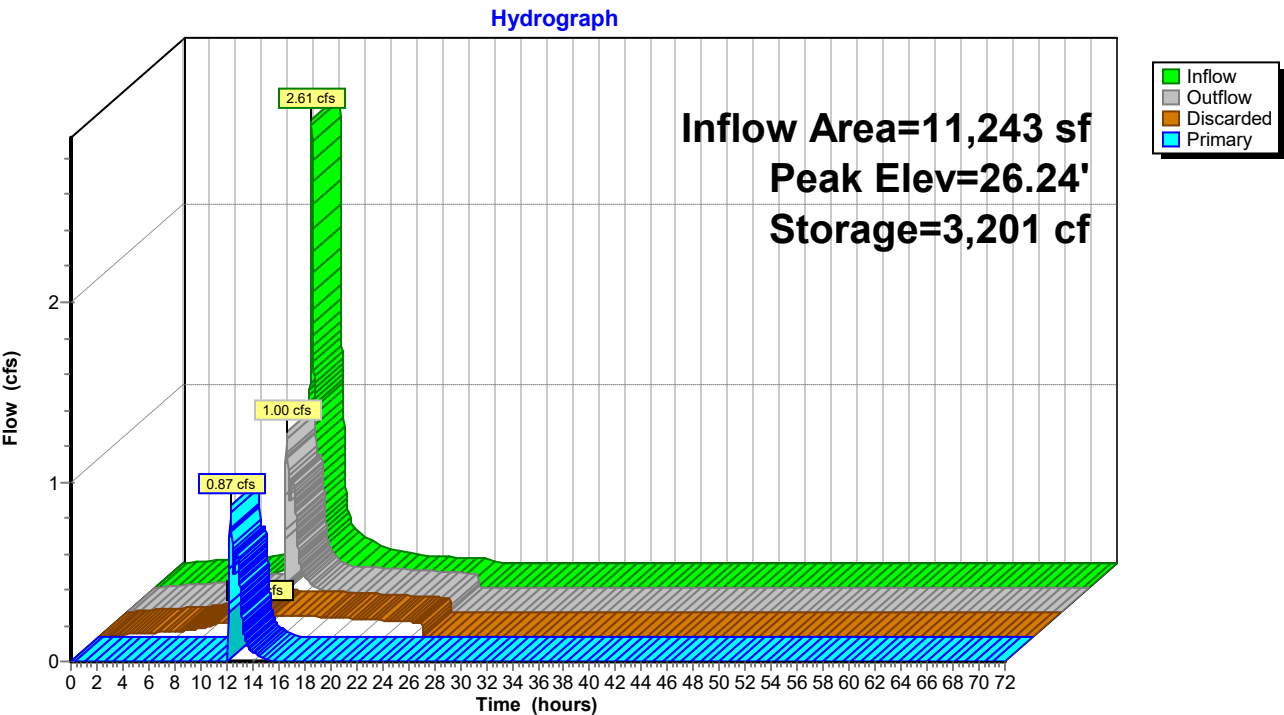
244 Chambers

199.2 cy Field

117.0 cy Stone



Pond IS1: Infiltration System 1



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Type III 24-hr 100-year Rainfall=11.70"

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Summary for Pond IS2: Infiltration System 2

[80] Warning: Exceeded Pond IS1 by 0.54' @ 11.99 hrs (0.00 cfs 284 cf)

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 5.98" for 100-year event
Inflow = 2.03 cfs @ 12.08 hrs, Volume= 9,689 cf
Outflow = 1.38 cfs @ 12.38 hrs, Volume= 9,689 cf, Atten= 32%, Lag= 17.5 min
Discarded = 0.18 cfs @ 12.38 hrs, Volume= 5,193 cf
Primary = 1.21 cfs @ 12.38 hrs, Volume= 4,496 cf

Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 26.17' @ 12.38 hrs Surf.Area= 549 sf Storage= 1,226 cf

Plug-Flow detention time= 17.3 min calculated for 9,688 cf (100% of inflow)
Center-of-Mass det. time= 17.3 min (766.9 - 749.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.20'	12.0" Round Culvert L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.20' / 15.00' S= 0.1185 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.90'	8.310 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.30'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.18 cfs @ 12.38 hrs HW=26.17' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=1.21 cfs @ 12.38 hrs HW=26.17' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.21 cfs of 8.16 cfs potential flow)
↑ **3=Orifice/Grate** (Orifice Controls 1.21 cfs @ 6.14 fps)
↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 100-year Rainfall=11.70"

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Pond IS2: Infiltration System 2 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

18 Chambers/Row x 2.35' Long = 42.22' Row Length +24.0" End Stone x 2 = 46.22' Base Length

6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

108 Chambers x 8.6 cf = 932.6 cf Chamber Storage

108 Chambers x 9.1 cf = 981.7 cf Displacement

2,169.5 cf Field - 981.7 cf Chambers = 1,187.8 cf Stone x 40.0% Voids = 475.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,407.8 cf = 0.032 af

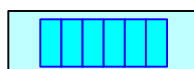
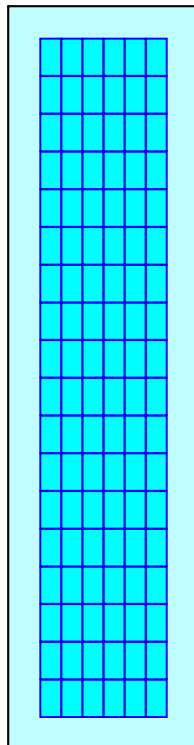
Overall Storage Efficiency = 64.9%

Overall System Size = 46.22' x 11.87' x 3.95'

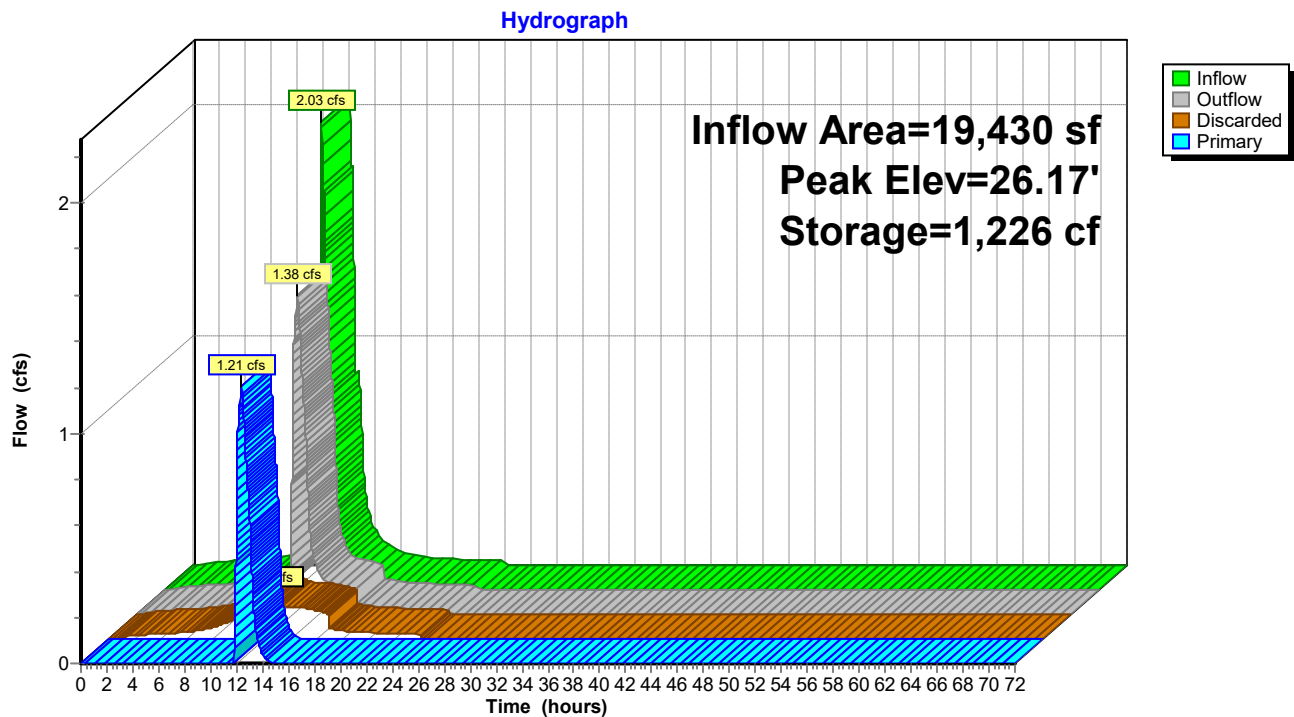
108 Chambers

80.4 cy Field

44.0 cy Stone



Pond IS2: Infiltration System 2



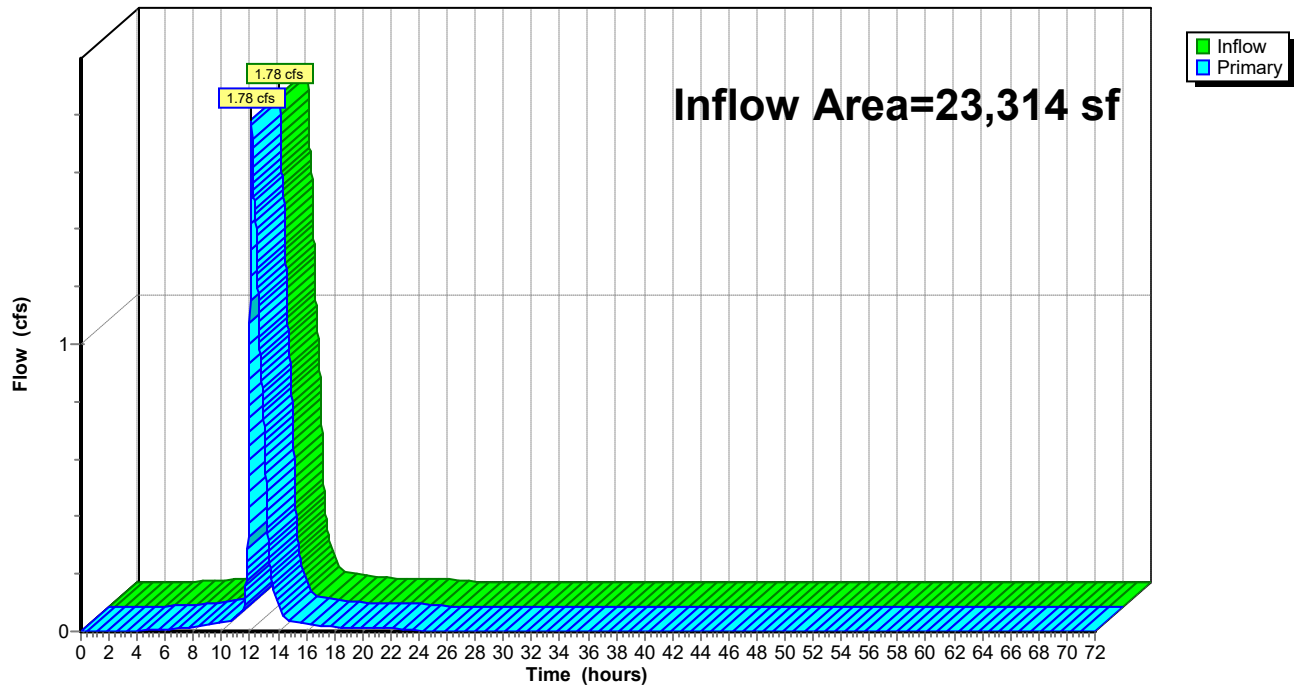
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 23,314 sf, 79.36% Impervious, Inflow Depth = 3.67" for 100-year event
Inflow = 1.78 cfs @ 12.11 hrs, Volume= 7,134 cf
Primary = 1.78 cfs @ 12.11 hrs, Volume= 7,134 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



PR-HYDRO

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Type III 24-hr wqv Rainfall=1.20"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1a: Subcatchment A1a Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=98 Runoff=0.18 cfs 595 cf

Subcatchment A1b: Subcatchment A1b Runoff Area=7,247 sf 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=98 Runoff=0.18 cfs 595 cf

Subcatchment A2: Subcatchment A2 Runoff Area=940 sf 18.40% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=50 Runoff=0.00 cfs 0 cf

Subcatchment A3a: Subcatchment A3a Runoff Area=3,996 sf 37.94% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=61 Runoff=0.00 cfs 0 cf

Subcatchment A3b: Subcatchment A3b Runoff Area=2,721 sf 85.19% Impervious Runoff Depth=0.41"
Tc=6.0 min CN=89 Runoff=0.03 cfs 94 cf

Subcatchment A4: Subcatchment A4 Runoff Area=1,163 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Pond IS1: Infiltration System 1 Peak Elev=22.72' Storage=64 cf Inflow=0.18 cfs 595 cf
Discarded=0.08 cfs 595 cf Primary=0.00 cfs 0 cf Outflow=0.08 cfs 595 cf

Pond IS2: Infiltration System 2 Peak Elev=23.05' Storage=33 cf Inflow=0.18 cfs 595 cf
Discarded=0.11 cfs 595 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 595 cf

Link A: Ex Drainage System Rindge Ave Inflow=0.03 cfs 94 cf
Primary=0.03 cfs 94 cf

Total Runoff Area = 23,314 sf Runoff Volume = 1,285 cf Average Runoff Depth = 0.66"
20.64% Pervious = 4,813 sf 79.36% Impervious = 18,501 sf

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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A1a: Subcatchment A1a

Runoff = 0.18 cfs @ 12.08 hrs, Volume= 595 cf, Depth= 0.99"
Routed to Pond IS1 : Infiltration System 1

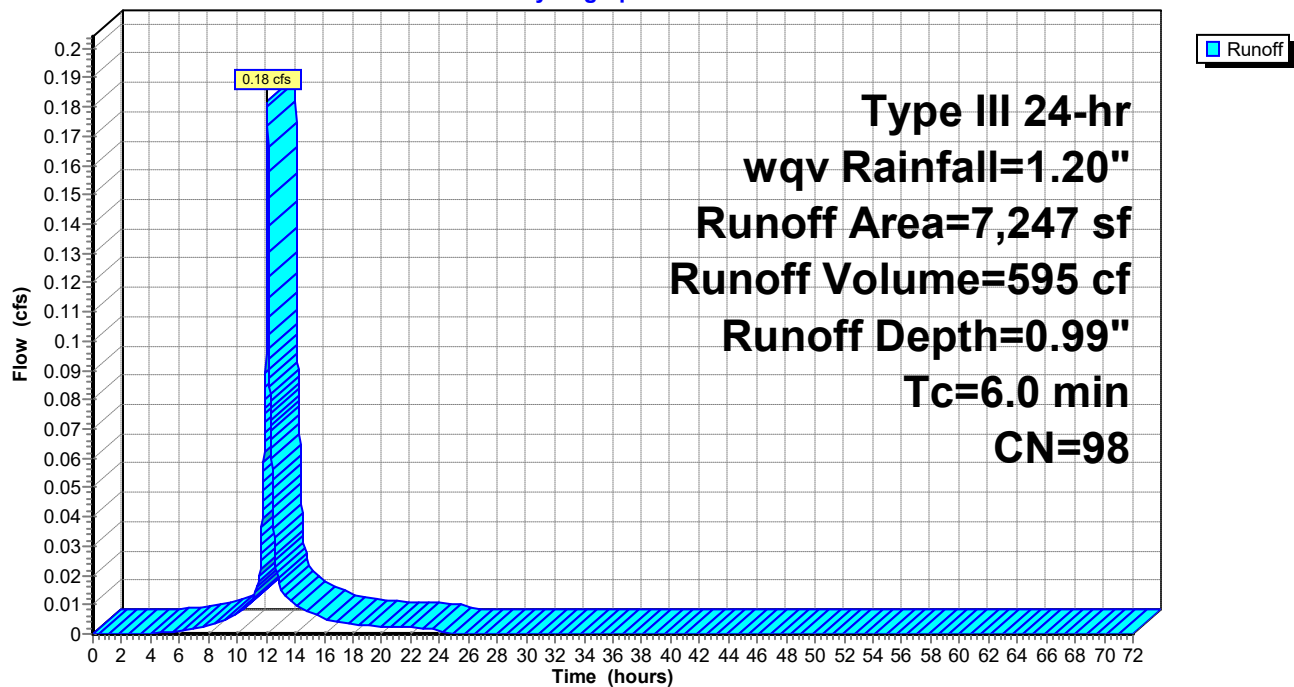
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1a: Subcatchment A1a

Hydrograph



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Summary for Subcatchment A1b: Subcatchment A1b

Runoff = 0.18 cfs @ 12.08 hrs, Volume= 595 cf, Depth= 0.99"
Routed to Pond IS2 : Infiltration System 2

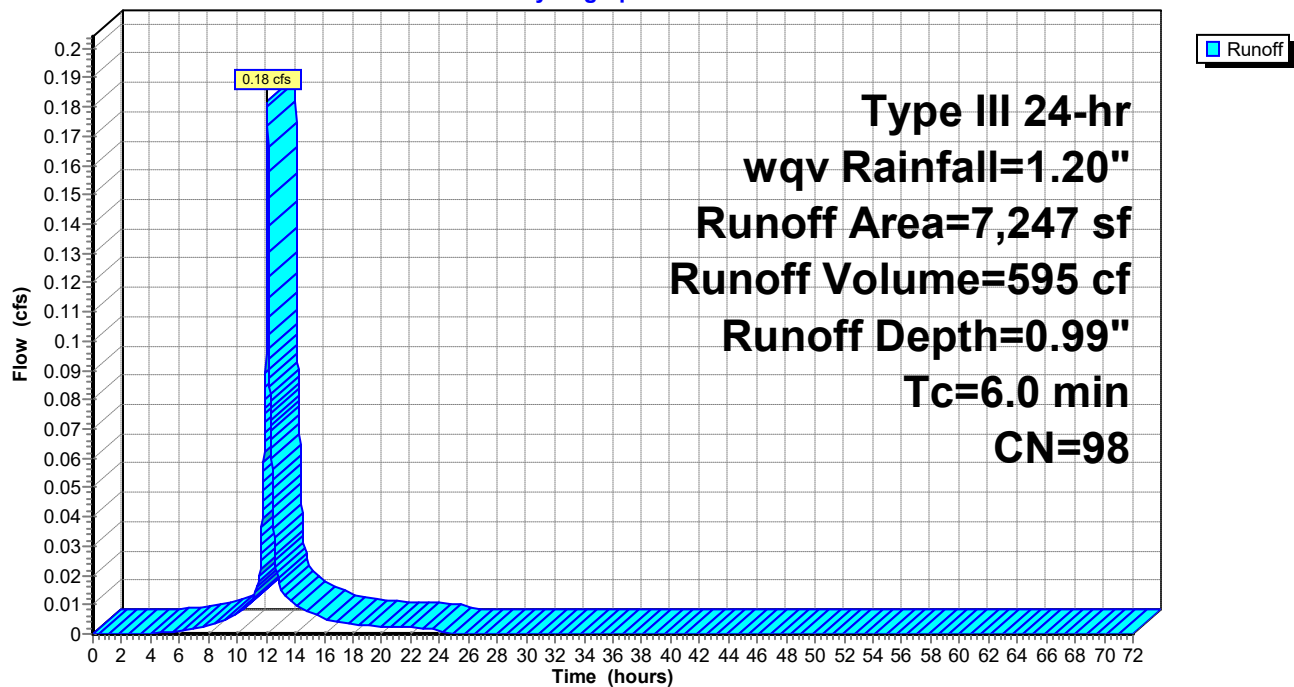
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

Area (sf)	CN	Description
7,247	98	Roofs, HSG A
7,247		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A1b: Subcatchment A1b

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A2: Subcatchment A2

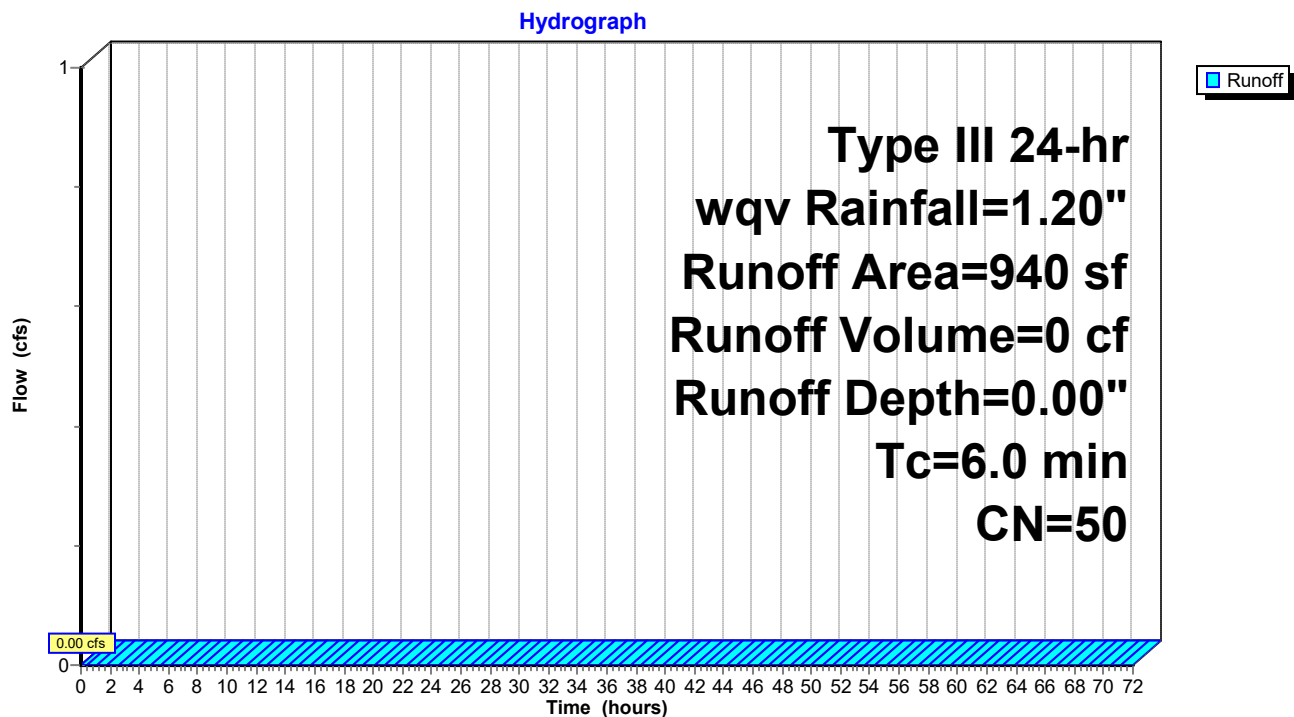
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond IS2 : Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

	Area (sf)	CN	Description
*	767	39	>75% Grass cover, Good
*	173	98	Paved parking
	940	50	Weighted Average
	767		81.60% Pervious Area
	173		18.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A2: Subcatchment A2

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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A3a: Subcatchment A3a

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond IS1 : Infiltration System 1

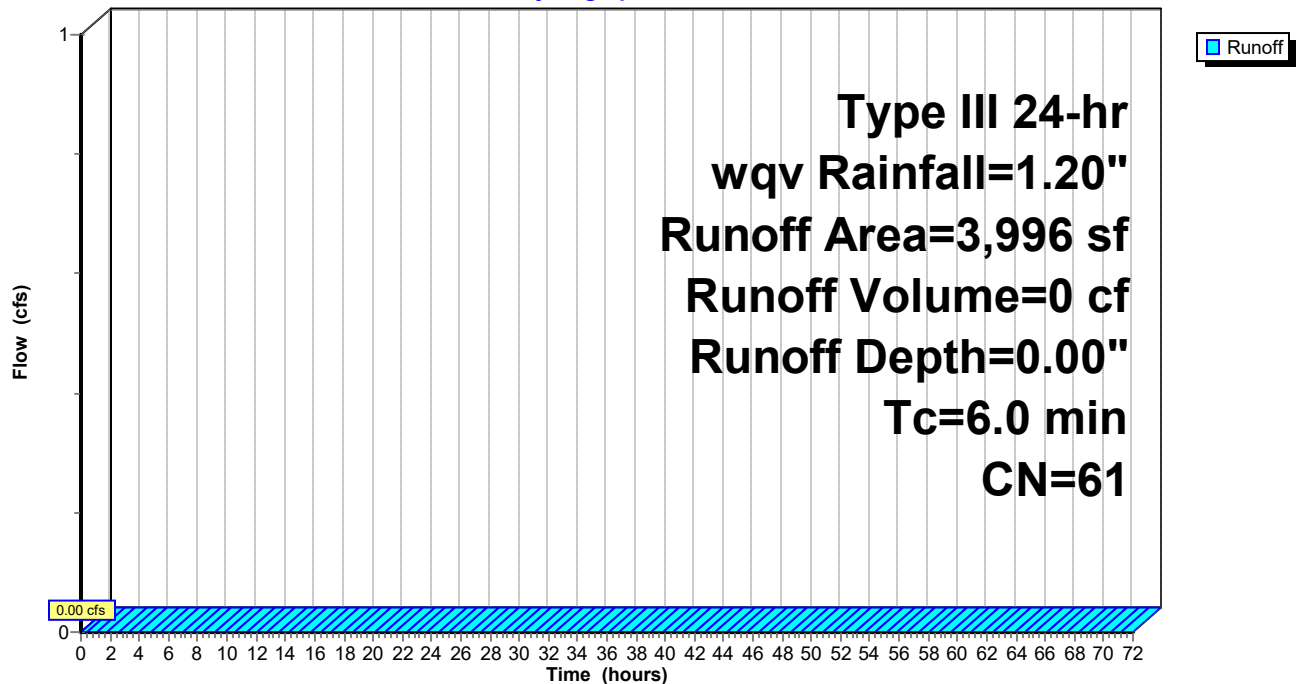
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

Area (sf)	CN	Description
1,516	98	Paved parking, HSG A
2,480	39	>75% Grass cover, Good, HSG A
3,996	61	Weighted Average
2,480		62.06% Pervious Area
1,516		37.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3a: Subcatchment A3a

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A3b: Subcatchment A3b

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 94 cf, Depth= 0.41"
Routed to Link A : Ex Drainage System Rindge Ave

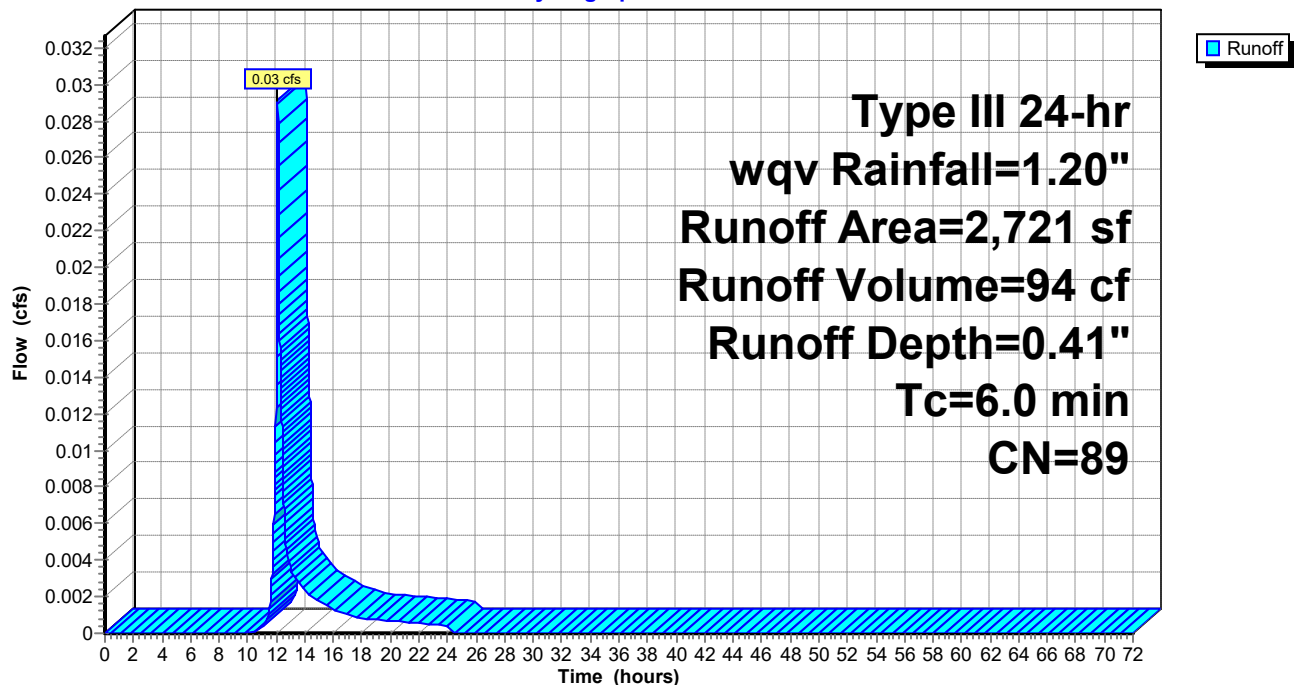
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

Area (sf)	CN	Description
2,318	98	Paved parking, HSG A
403	39	>75% Grass cover, Good, HSG A
2,721	89	Weighted Average
403		14.81% Pervious Area
2,318		85.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, tc

Subcatchment A3b: Subcatchment A3b

Hydrograph



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Subcatchment A4: Subcatchment A4

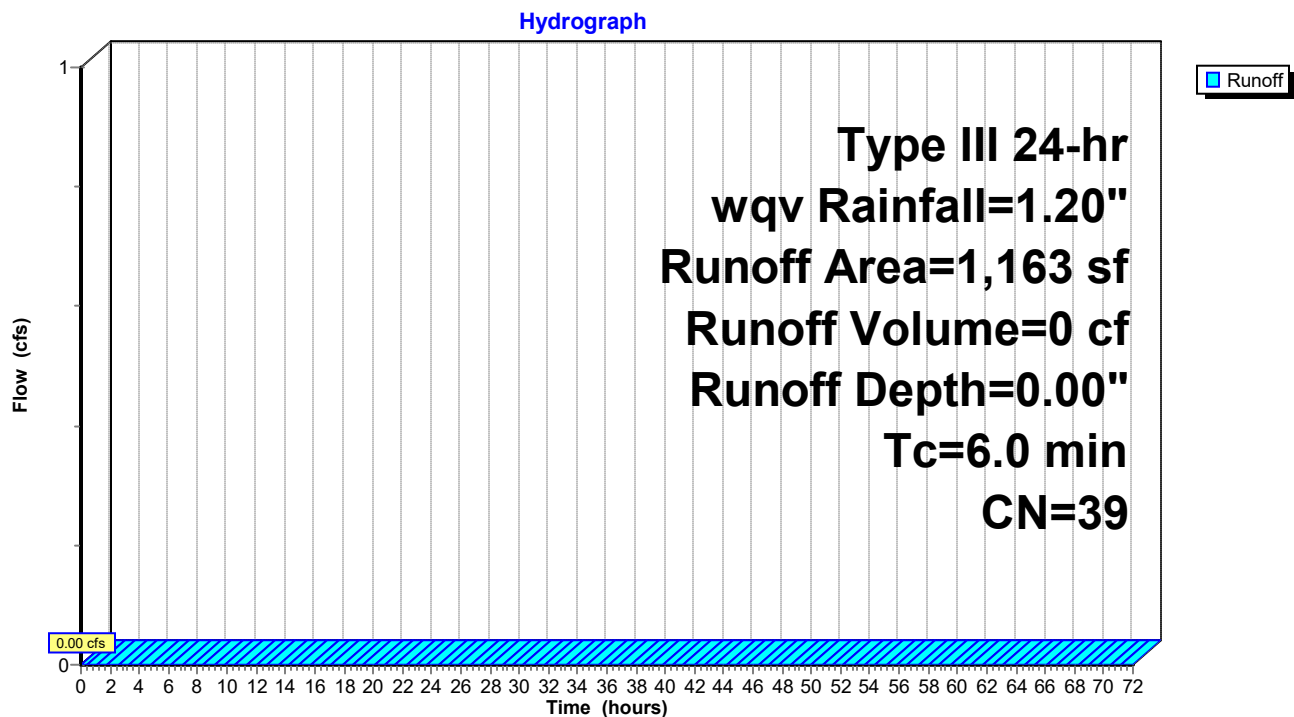
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link A : Ex Drainage System Rindge Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr wqv Rainfall=1.20"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
1,163		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TC

Subcatchment A4: Subcatchment A4

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Type III 24-hr wqv Rainfall=1.20"

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Summary for Pond IS1: Infiltration System 1

Inflow Area = 11,243 sf, 77.94% Impervious, Inflow Depth = 0.64" for wqv event
 Inflow = 0.18 cfs @ 12.08 hrs, Volume= 595 cf
 Outflow = 0.08 cfs @ 12.28 hrs, Volume= 595 cf, Atten= 57%, Lag= 11.6 min
 Discarded = 0.08 cfs @ 12.28 hrs, Volume= 595 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 22.72' @ 12.28 hrs Surf.Area= 1,361 sf Storage= 64 cf

Plug-Flow detention time= 4.0 min calculated for 595 cf (100% of inflow)
 Center-of-Mass det. time= 4.0 min (786.0 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.60'	1,264 cf	9.25'W x 147.09'L x 3.95'H Field A 5,378 cf Overall - 2,218 cf Embedded = 3,160 cf x 40.0% Voids
#2A	23.10'	2,107 cf	Ferguson R-Tank SD 4 x 244 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 244 Chambers in 4 Rows
		3,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.10'	12.0" Round Culvert L= 95.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.10' / 22.15' S= 0.0100 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.60'	2.410 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.90'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.05'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.08 cfs @ 12.28 hrs HW=22.72' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.60' TW=22.90' (Dynamic Tailwater)
 ↑ **1=Culvert** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr wqv Rainfall=1.20"

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Pond IS1: Infiltration System 1 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

61 Chambers/Row x 2.35' Long = 143.09' Row Length +24.0" End Stone x 2 = 147.09' Base Length

4 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 9.25' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

244 Chambers x 8.6 cf = 2,107.1 cf Chamber Storage

244 Chambers x 9.1 cf = 2,218.0 cf Displacement

5,377.8 cf Field - 2,218.0 cf Chambers = 3,159.9 cf Stone x 40.0% Voids = 1,263.9 cf Stone Storage

Chamber Storage + Stone Storage = 3,371.0 cf = 0.077 af

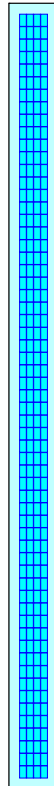
Overall Storage Efficiency = 62.7%

Overall System Size = 147.09' x 9.25' x 3.95'

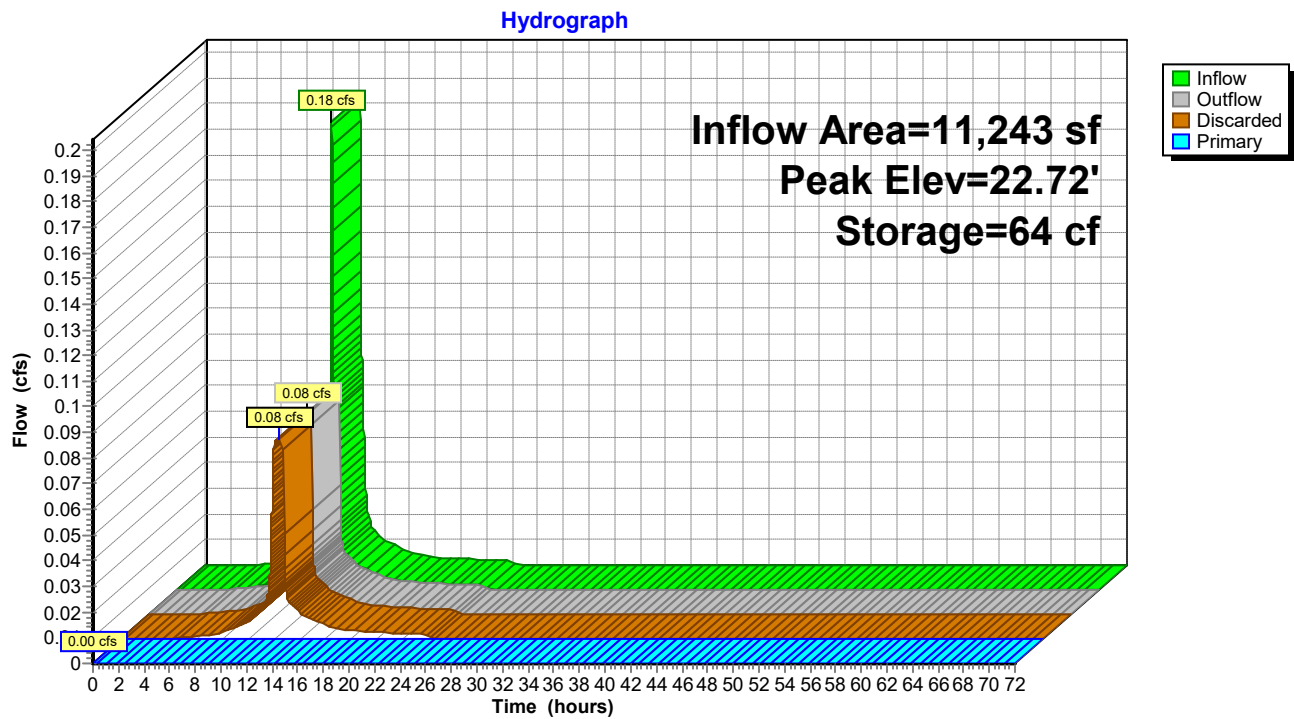
244 Chambers

199.2 cy Field

117.0 cy Stone



Pond IS1: Infiltration System 1



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Type III 24-hr wqv Rainfall=1.20"

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Summary for Pond IS2: Infiltration System 2

Inflow Area = 19,430 sf, 83.29% Impervious, Inflow Depth = 0.37" for wqv event
 Inflow = 0.18 cfs @ 12.08 hrs, Volume= 595 cf
 Outflow = 0.11 cfs @ 12.19 hrs, Volume= 595 cf, Atten= 40%, Lag= 6.3 min
 Discarded = 0.11 cfs @ 12.19 hrs, Volume= 595 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link A : Ex Drainage System Rindge Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 23.05' @ 12.19 hrs Surf.Area= 549 sf Storage= 33 cf

Plug-Flow detention time= 1.1 min calculated for 595 cf (100% of inflow)
 Center-of-Mass det. time= 1.1 min (783.1 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.90'	475 cf	11.87'W x 46.22'L x 3.95'H Field A 2,170 cf Overall - 982 cf Embedded = 1,188 cf x 40.0% Voids
#2A	23.40'	933 cf	Ferguson R-Tank SD 4 x 108 Inside #1 Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf 108 Chambers in 6 Rows
		1,408 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	18.20'	12.0" Round Culvert L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 18.20' / 15.00' S= 0.1185 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	22.90'	8.310 in/hr Exfiltration over Wetted area Phase-In= 0.01'
#3	Device 1	24.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	26.30'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.11 cfs @ 12.19 hrs HW=23.05' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.90' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.00 cfs of 6.12 cfs potential flow)

↑ **3=Orifice/Grate** (Controls 0.00 cfs)

↑ **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr wqv Rainfall=1.20"

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Pond IS2: Infiltration System 2 - Chamber Wizard Field A

Chamber Model = Ferguson R-Tank SD 4 (Ferguson R-Tank SD)

Inside= 15.7"W x 35.4"H => 3.68 sf x 2.35'L = 8.6 cf

Outside= 15.7"W x 35.4"H => 3.88 sf x 2.35'L = 9.1 cf

18 Chambers/Row x 2.35' Long = 42.22' Row Length +24.0" End Stone x 2 = 46.22' Base Length

6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width

6.0" Stone Base + 35.4" Chamber Height + 6.0" Stone Cover = 3.95' Field Height

108 Chambers x 8.6 cf = 932.6 cf Chamber Storage

108 Chambers x 9.1 cf = 981.7 cf Displacement

2,169.5 cf Field - 981.7 cf Chambers = 1,187.8 cf Stone x 40.0% Voids = 475.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,407.8 cf = 0.032 af

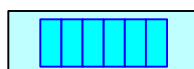
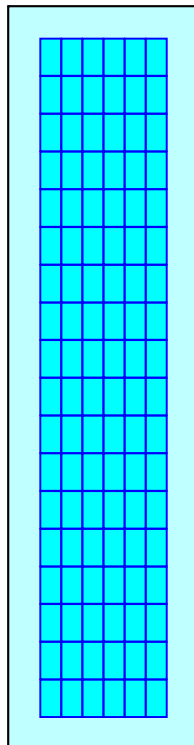
Overall Storage Efficiency = 64.9%

Overall System Size = 46.22' x 11.87' x 3.95'

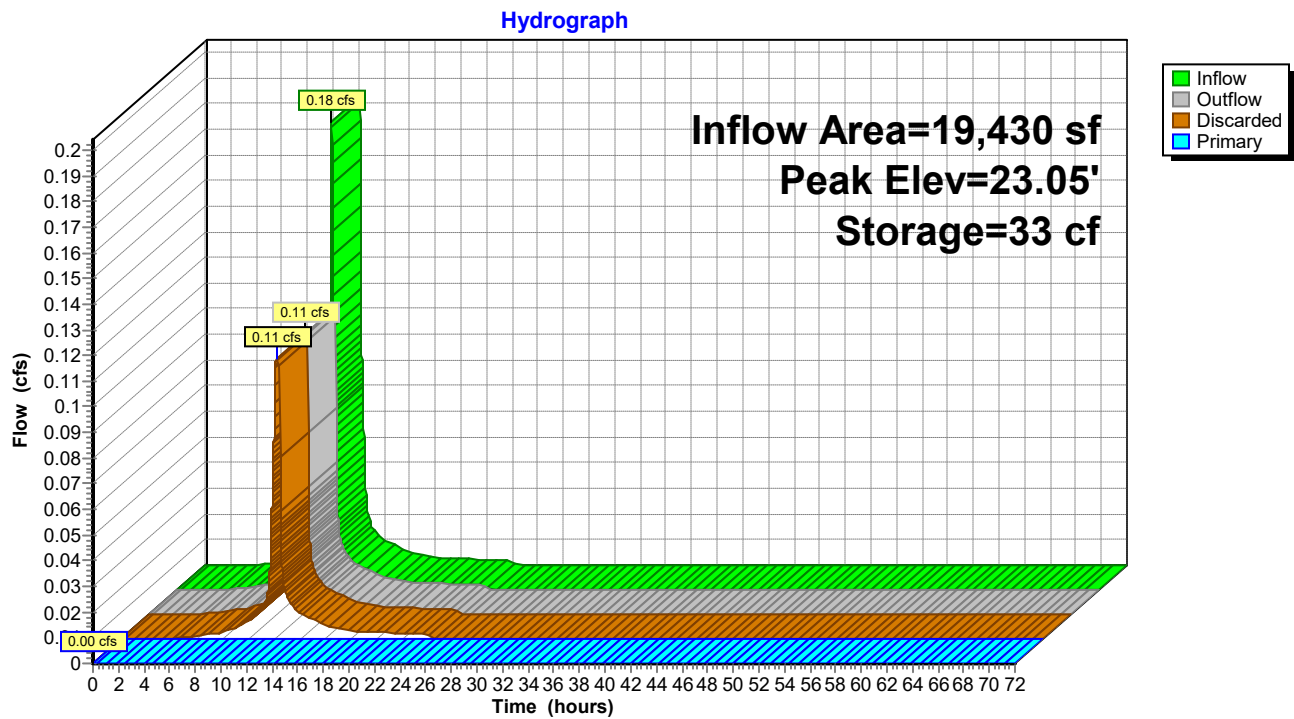
108 Chambers

80.4 cy Field

44.0 cy Stone



Pond IS2: Infiltration System 2



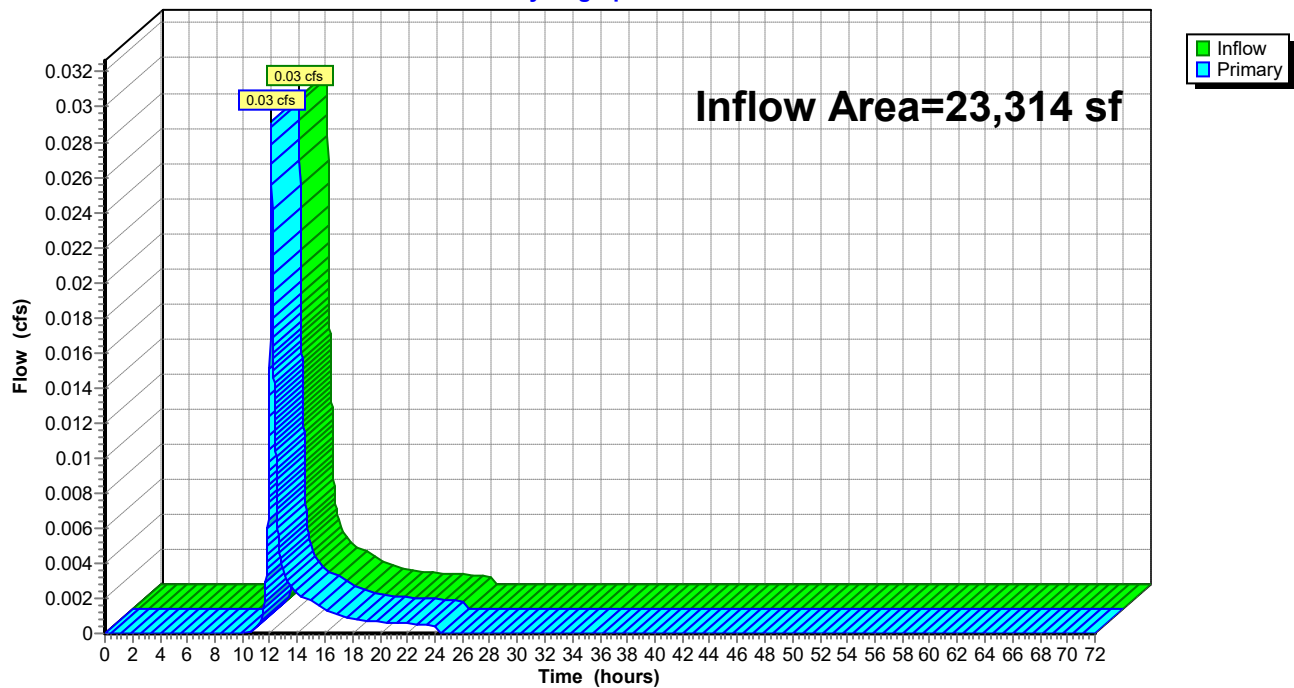
Summary for Link A: Ex Drainage System Rindge Ave

Inflow Area = 23,314 sf, 79.36% Impervious, Inflow Depth = 0.05" for wqv event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 94 cf
Primary = 0.03 cfs @ 12.09 hrs, Volume= 94 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link A: Ex Drainage System Rindge Ave

Hydrograph



Noise Mitigation Narrative

The Project Team does not anticipate an increase in noise impacts associated with the residential or commercial use at the Project Site. The City of Cambridge Police and Inspectional Services Department regulate noise in the City of Cambridge based on zoning and land use classification. The regulations set fixed noise limits for daytime and nighttime use of equipment serving the building (for residential areas, a maximum of 60 dBA for daytime use, and 50 dBA for nighttime use is required). These levels provide limits for equipment sound assessed at the property lines of the Project. The limits apply to equipment that operates on a significant basis to serve the building, such as climate control equipment and fans. In addition to the overall sound level requirement, the regulations list specific octave band frequency limits for daytime and nighttime periods.

The primary sources of exterior sound for the Project will include heating, cooling, and ventilation systems. Based on the systems design and location, the equipment is not expected to produce significant sound levels at the building property lines, though noise control measures will be provided if required.

Intermittent increases in noise levels will occur in the short-term during construction. Construction work will comply with the requirements of the City of Cambridge Noise Ordinance. Noise impacts will be controlled during construction, as appropriate through the use of mufflers on heavy equipment, construction hour restrictions, and other noise mitigation techniques.

Day/Night Noise Level (DNL) Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- Note #2:** DNL Calculator assumes roadway data is always entered.

DNL Calculator

Site ID

350 Rindge

Record Date

08/05/2026

User's Name

Road # 1 Name:

Rindge Ave

Road #1

Vehicle Type	Cars ☒	Medium Trucks ☐	Heavy Trucks ☐
Effective Distance	1		
Distance to Stop Sign	400		
Average Speed	25		
Average Daily Trips (ADT)	80		
Night Fraction of ADT	25		
Road Gradient (%)			
Vehicle DNL	65	0	0
Calculate Road #1 DNL	65	Reset	

Add Road Source

Add Rail Source

Airport Noise Level

Loud Impulse Sounds?

☐Yes ☒No

Combined DNL for all Road and Rail sources

65

Combined DNL including Airport

N/A

Site DNL with Loud Impulse Sound

Calculate

Reset

Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide \(/resource/3822/day-night-noise-level-assessment-tool-user-guide/\)](#)

[Day/Night Noise Level Assessment Tool Flowcharts \(/resource/3823/day-night-noise-level-assessment-tool-flowcharts/\)](#)

[Federal Railroad Administration Railroad Operations Data Sources \(https://www.hudexchange.info/resource/6027/federal-railroad-administration-railroad-operations-data-sources/\)](#)

- **No Action Alternative:** Cancel the project at this location
- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
 - Contact your Field or Regional Environmental Officer (/programs/environmental-review/hud-environmental-staff-contacts/)
 - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
 - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
 - Incorporate natural or man-made barriers.
 - Construct noise barrier. See the **Barrier Performance Module** (/programs/environmental-review/bpm-calculator/)